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ABSTRACT

Developed for vocational educators of short-term or long-term programs, this manual presents a complete competency-based curriculum in building maintenance for the advanced limited English proficient student. Following instructions on use of the manual and recommended references, a student tracking system and record sheet are provided, which list task number, competency description, job title pertaining to the competency, and date of completion. The bulk of the manual consists of competency sheets for each of the 711 tasks covered on the tracking form, focusing on the following eight areas: (1) plumbing; (2) custodial; (3) carpentry; (4) masonry; (5) electrical; (6) heating; (7) small engines; and (8) supporting skills such as welding, swimming pool maintenance and appliance service maintenance. Each competency sheet presents the task the student will perform; conditions under which the task will be performed; tools and equipment; task steps; student evaluation sheet or written test; learning activities; and supplemental sheets which provide information or study words. A sample certificate of completion is appended. (LAL)

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ED260784

PROJECT VOICE

Vocational Occupations

for

Industrial Communications English

A Competency Based Education Curriculum
for the
Limited English Proficient
in
Building Maintenance

Author: Diana Chaloupka

Editor: Kathleen Papierniak

COLLEGE OF LAKE COUNTY

Grayslake, Illinois

June, 1985

JC 850 506

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PROJECT VOICE

A Competency Based Curriculum

for the

Limited English Proficient

in

BUILDING MAINTENANCE

TABLE OF CONTENTS

I. PREFACE

II. ACKNOWLEDGMENTS

III. HOW TO USE THE MANUAL AND ITS CONTENTS

IV. RECOMMENDED REFERENCES

V. STUDENT TRACKING SYSTEM AND RECORD SHEET

VI. PROJECT VOICE COMPETENCY SHEETS

VII. CERTIFICATE OF COMPLETION

I.

PREFACE
BUILDING MAINTENANCE
PROJECT VOICE

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II.

ACKNOWLEDGMENTS

It is recognized that many people, through their consultation and assistance, have contributed immensely to the successful completion of this competency based curriculum.

Gratitude is expressed to Dr. Oen and Mike Anderson for their assistance during the development of Project VOICE.

Special thanks is given to Kathleen Papierniak, Program Manager, JTPA, Office of Employment Training at the College of Lake County, for her support, guidance and leadership in putting together this Project.

Special thanks is also due Helen Hogan, Diana Chaloupka, Wilfred Pouler and Sherrie Williams for their hard work and dedication in completing Project VOICE.

III.

HOW TO USE THE MANUAL AND ITS CONTENTS

The Project VOICE Competency Based Curriculum has been developed to provide vocational educators of short-term or long-term programs with a complete field-tested curriculum in building maintenance for the advanced (third level) limited English proficient student. There are eight areas of concentration within the curriculum: These include plumbing, custodial, carpentry, masonry, electrical, heating, small engines and supportive skills which are welding, swimming pool maintenance and appliance service maintenance.

Competency sheets were completed for each task listed on the Student Tracking system and Record Sheet. Each competency sheet contains the competency title, learning activities to achieve, and evaluation criteria. The learning activities are written in the present tense and the student evaluation checklist is written in the past tense. The competencies for each area of concentration (plumbing, custodial etc.) are arranged in hierarchical order so that all learning builds on previous learnings and projects completed. However; a student can enter into any area of concentration without studying those previous.

Each task is presented in the form of a guide containing:

I. One or more competency sheets which state:

- The task the student will perform.
- The conditions under which the task will be performed.
- The tools and equipment which will be used to do the task.
- The "TASK STEPS" to be followed for hands on application of the task.

HOW TO USE THE MANUAL AND ITS CONTENTS (cont'd.)

II. Student evaluation sheet or written test which determines:

- If the student has mastered the task.
- If the student has scored satisfactorily on each item listed on the checklist and/or written test.

III. Learning activities which give:

- The student step by step guidance on the sequence for working through the task guide.

IV. Supplemental sheet which are:

- Information sheets.
- Study words (new vocabulary).

Recommended References

Whenever the word "textbook" is mentioned in the curriculum it refers to the Complete Do-it-Yourself Manual, Reader's Digest, 1st Edition, 1973, Sixteenth Printing, September 1981. Each student should have this book for this course. The many visuals in this textbook will enable the student to better grasp the substance of each task.

Student Tracking System and Record Sheet

A tracking system and record sheet is included in the manual to assist the instructor in monitoring student completion of the competencies. It can also be used by the student to keep track of their individual progress. At the completion of the program, this record-keeping system provides the basis for completing the certificate.

The student tracking system and record sheet is designed to be used as a wall chart, for the students to use as a tracking system throughout the program. The chart lists the task number, competency description, job title pertaining to the competency, and dates completed for each student.

III.

HOW TO USE THE MANUAL AND ITS CONTENTS (cont'd)

The instructor should initial all of the competencies as they are completed. With these sheets, the instructor will always know where each student stands in relation to the competencies completed and the competencies remaining to be completed. All competencies dated and initialed will be listed on the certificate.

Certificate of Completion

It is recommended that a certificate be awarded each person listing the competencies completed. The front of the certificate is pre-printed with the name of the project and training program in which enrolled. Space is provided for each student's name, date line, and signature lines for instructor and school official. The back side of the certificate has space for typing the competency titles that each student has completed. Only those competencies the student has completed are typed on the certificate. The certificate is typed at the end of the training program, and is prepared regardless of whether or not a student has completed all of the program competencies. The certificate is an aid to employment. The students take the certificate with them on job interviews to show prospective employers what competencies they have mastered. A sample certificate is included to illustrate what the completed certificate may look like.

These steps and procedures are recommended to implement the building maintenance program in your school. Begin by reviewing the list of competencies on the student tracking and record sheets, the entire catalog of competency sheets, and the recommended resources.

III.

HOW TO USE THE MANUAL AND ITS CONTENTS (cont'd)

Set up your instructor tracking system and record sheet so you will be able to monitor each student's progress. Develop or adapt a pre-test to screen prospective students. After administrating the pre-test, analyze the results and identify your goals and objectives for your program and for the student. As each student completes a competency, use the evaluation procedures listed in each competency to evaluate the student's mastery of each individual competency. At the end of the training program, prepare a certificate for each student. For additional help in implementing the building maintenance program in your school, contact the Competency Based Vocational Education Consultant in your area, or Dr. Urban Oen at the Lake County Vocational Center, 19525 W. Washington Street, Grayslake Illinois 60030 (312) 223-6681, or the Illinois State Board of Education, Springfield, Illinois.

Helen Hogan

IV.

RECOMMENDED REFERENCES

1. Textbook - Complete Do-it-Yourself Manual - Reader's Digest 1st Ed., 1973, Sixteenth Printing, September 1981
2. Automatic Dishwasher, Food Disposer and Trash Masher - Whirlpool Corp., 1978
3. Basic Electricity, New Jersey Dept. of Education
4. Do-it-Yourself Plumbing - Max Alth., Times Mirror Mag., 1st Ed., 1975
5. Electricity and Electronics Basic - William B. Steinberg & Walter Ford, American Technical Society Ed., 1974
6. Fix-it-Yourself Manual - Reader's Digest 1st Ed., 1977
7. Good School Maintenance - ISAB Service Associates 1st Ed., 1976
8. Home Repair - Times and Mirror, revised Ed., 1981
9. National Electrical Code - International Brotherhood of Electrical Workers
10. Phase I (s) - Lennox Industries Inc. Ed., 1980 "Heating Thermostat"
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12. Plant Maintenance Manual - E. Clement and C. Harrington, Chilton Co. 2nd Ed., 1955
13. Previews Curriculum - Northwest Educational Cooperative, Arlington Heights, Il.
14. Practical Electrical Wiring - H.P. Richter McGraw Hill Book Co. 9th Ed., 1972
15. Sheet Metal Hand Processes - Zinngrade and Schumacher, Delmar Publishers, 1st Ed., 1974
16. The Housekeeping Procedure Manual - 1976, U.S. Govt. Ed., 1976
17. Welding Skills - Gianchino, Weeks American Technical Pub., 1976
18. Welding Skills and Practice - Gianchino, Weeks American Technical Pub., 1976

V.

STUDENT TRACKING SYSTEM

AND

RECORD SHEET

V.
BUILDING MAINTENANCE
PLUMBING RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
01	Cut and renew threads and install pipe fittings		
02	Join copper by sweating, compression and flare joints		
03	Repair valves and faucets		
04	Repair a leak in a ball cock valve		
05	Install commode, wax seal and seat		
06	Cut metal tubing, plastic pipe and sheet metal		
07	Drain the water from plumbing		
08	Open clogged drain using vacuum and chemicals		
09	Clear sewer using hand and power sewer auger		
10	Cut and join cast iron pipe using caulking		
11	Install a collar clamp		
12	Cut and join plastic pipe (PVC)		
13	Install a shower head, faucet and shut-off valve		
14	Install a lavatory-water and drain		
15	Repair a leak in a water line		
16	Install a tap-on fitting on a water line		
17	Patch a leak in a cast iron pipe		
18	Remove standing water using sump pump		
19	Repair or replace a flush valve		
20	Shorten bolt and machine screw		

Name:________________________________ Social Security #____________________

Phone Number:__________________________ Dates: Entrance__________Exit__________

V.

BUILDING MAINTENANCE
PLUMBING RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
21	Cut ceramic and quarry tile		
22	Test for gas leak in pipes using soap solution		
23	Thaw frozen pipes		
24	Locate wall studs and plumbing in a wall		

Name:____________________

Social Security #____________________

Phone Number:____________________

Dates: Entrance__________Exit__________

V.

BUILDING MAINTENANCE

CUSTODIAL RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
100	Clean a grease trap		
101	Damp and wet mop floor		
102	Scrub floor by using a buffer		
103	Remove stains (spots) from floor		
104	Vacuum carpet		
105	Wet shampoo a carpet		
106	Clean a soiled, painted surface		
107	Clean restroom		
108	Strip (remove) wax using scrubing machine		
109	Apply sealer and wax floor		
110	Polish floor using a buffing machine		
111	Clean windows		
112	Clean metal surfaces (brass, stainless, etc.)		
113	Clean upholstered furniture (material covered furniture)		
114	Clean chalkboards (blackboards)		
115	Replace light bulbs and flouorescent tubes		
116	Disassemble and clean buffing machine		
117	Disassemble and clean wet/dry vacuum		
118	Control of insect and rodent problems		

Name:______________________________

Social Security #________________________

Phone Number:________________________

Dates: Entrance__________Exit____________

V.

BUILDING MAINTENANCE
CARPENTRY RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
200	Cut and plane a board width and length and cut inside and outside curves		
201	Cut molding to fit inside and outside corners using a miter box		
202	Drill and bore holes of different diameters and depths using hand operated drills		
203	Chisel out a notch (opening) for door hinge		
204	Cut length and width of a board using a portable circular saw, then cut inside and outside curves using a portable saber saw		
205	Drill and bore holes using powered hand drills		
206	Using a portable router, cut a notch (opening) for a door hinge		
207	Sand the surface of a board using orbital and belt sanders		
208	Crosscut and rip wood on a table saw		
209	Crosscut and rip cut wood using a radial arm saw		
210	Cut curved edges on a band saw		
211	Plane edges and surfaces with jointer		
212	Bore (cut) holes to various depths and diameters		
213	Cut molding with a powered miter saw		
214	Cut a rabbet joint on bench saw		
215	Make dowel glue joints		
216	Make splined joints		
217	Make a splined miter joint		
218	Make box joint using a bench saw		

Name:______________________________ Social Security #____________________

Phone Number:_________________________ Dates: Entrance__________ Exit__________

V.

BUILDING MAINTENANCE

CARPENTRY RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
219	Make a blind mortise to make joint		
220	Sharpen auger bits and twist drill blade		
221	Sharpen wood chisels and plane blade		
222	Sharpen hand saws		
223	Install plywood sheathing on outside of building		
224	Install wallboard tape joints and cover nails		
225	Sand finish wallbaord taped joints		
226	Rough-in (cut to make) windows and door opeings		
227	Install inside and outside window		
228	Install door janbs and hang door		
229	Replace outside and inside door trim (molding)		
230	Replace baseboard and shoe molding		
231	Patch a hole in a floor		
232	Repair siding on building		
233	Repair a small hole in wallboard		
234	Repair a large hole in wall board		
235	Replace damaged floor tile		
236	Replace ceramic tile on floor		
237	Replace a broken window and reglaze it		
238	Replace damaged asphalt roof shingles		

Name: ____________________

Social Security # ____________________

Phone Number: ____________________

Dates: Entrance __________ Exit __________

V.

BUILDING MAINTENANCE

CARPENTRY RELATED DUTIES

STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
239	Replace damaged asphalt roof shingles		

Name:________________________

Social Security #____________________

Phone Number:____________________

Dates: Entrance__________Exit__________

V.

BUILDING MAINTENANCE
MASONRY RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
300	Remove a section of damaged sidewalk		
301	Mix, place, finish and cure concrete		
302	Fill a hole in concrete		
303	Install a fastener in a solid masonry wall		
304	Repair cracks in a stucco wall		
305	Repair damaged section of stucco wall		
306	Repair leak in masonry wall		
307	Repair chimney brick mortar joints		
308	Replace chimney flashing		

Name: ______________________

Social Security # ______________________

Phone Number: ______________________

Dates: Entrance __________ Exit __________

V.

BUILDING MAINTENANCE

ELECTRICAL RELATED DUTIES

STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
400	Identify what electricity is and how it works		
401	Identify what a ground is and the danger that exists when electrical equipment is not grounded		
402	Locate and identify parts in a house's service entrance hookup and fuse box		
403	Connect D.C. and A.C. volt power supplies together and measure voltage		
404	Test and replace fuses and circuit breakers		
405	Check voltage, amperage, and resistance on energized A.C. circuit (alternating current)		
406	Use the National Electrical Code book to find information		
407	Install main electrical service panel		
408	Divide branch circuits to stop electrical overload		
409	Match amp values of fuse to wire size of branch circuit		
410	Install thin-wall steel tubing and outlet box		
411	Pull wires through thin-wall tubing and connect wires to outlet receptacles		
412	Install armored BX cable (metallic sheathed cable)		
413	Replace romex cable (nonmetallic sheathed cable)		
414	Install electrical grounding wires		
415	Identify A.C. Single-phase and A.C. Three-phase voltage circuits		
416	Install a light switch		
417	Install 3-way and 4-way light switches		
418	Install electrical outlet on finished wall		

Name: ______________________________

Social Security # ______________________________

Phone Number: ______________________________

Dates: Entrance __________ Exit __________

V.
BUILDING MAINTENANCE
ELECTRICAL RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
419	Replace fluorescent light ballast		
420	Test electrical circuit for electrical continuity		
421	Test electrical circuit for resistance value		
422	Measure voltage of a circuit		
423	Measure the amperage flowing through a D.C. circuit		
424	Check amperage on an A.C. electrical appliance		
425	Test and trouble-shoot an A.C. motor		

Name:____________________

Social Security #____________________

Phone Number:____________________

Dates: Entrance__________Exit__________

V.

BUILDING MAINTENANCE
HEATING RELATED DUTIES
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
500	Locate parts on a basic hot water system and identify their function		
501	Locate parts on a basic hot air system and identify their function		
502	Identify parts on a gas burner system and turn on system		
503	Test and adjust pilot burner and thermocouple on gas furnace		
504	Trouble-shoot and repair thermostat		
505	Locate and test the low voltage control circuit		
506	Check safety controls while heating system is operating		
507	Check components of oil burner		
508	Locate and check low voltage controls		
509	Trouble-shoot heating system		
510	Locate and identify components on an electrical heating system		
511	Check heating on an electric furnace		

Name: ____________________ Social Security # ____________________

Phone Number: ____________________ Dates: Entrance __________ Exit __________

V.

BUILDING MAINTENANCE
SMALL ENGINE RELATED DUTIES

STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
600	Identify and inspect components of a 2 cycle gasoline engine		
601	Identify and inspect components of a 4 cycle gasoline engine		
602	Identify and inspect the parts of the carburetor on each of the three small engines		
603	Adjust ignition points and carburetor		
604	Trouble-shoot a small gasoline engine		
605	Prepare engine for winter storage		

Name:______________________________

Phone Number:_________________________

Social Security #__________________

Dates: Entrance__________Exit__________

V.

BUILDING MAINTENANCE
SUPPORTIVE SKILLS
STUDENT TRACKING SYSTEM and RECORD SHEET

Task Number	Competency Description	Date	Instr. Initials
700	Do a maintenance check of a fork lift truck then move heavy equipment using truck		
701	Perform routine maintenance to pool and filter equipment		
702	Add chemicals to water in swimming pool		
703	Strike an arc using metal arc welding equipment		
704	Weld two pieces of steel together		
705	Set up and adjust flame on oxy-acetylene equipment then flame cut a piece of steel		
706	Do maintenance procedures on hot water electric heater		
707	Do service maintenance on a dishwasher		
708	Do maintenance on a food disposer		
709	Do service maintenance on an automatic clothes washer		
710	Do service maintenance on clothes dryer		
711	Operate lawn (yard) equipment		

Name:____________________

Social Security #____________________

Phone Number:____________________

Dates: Entrance__________ Exit__________

VI.

PROJECT VOICE COMPETENCY SHEETS

for

BUILDING MAINTENANCE

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Cut and renew pipe threads and install pipe fittings

TASK NO: 01

STUDENT WILL:
A. Cut thread on iron pipe by hand
B. Renew old pipe threads
C. Renew old pipe fittings
D. Install screw-on fittings

GIVEN: Sections of iron pipe, old pipe fittings, a screw-on fitting for a water pipe, tools, and supplies.

TOOLS & EQUIPMENT: pipe dies, cutting oil, pipe vice, or pipe wrench, pipe fittings, pipe reamer, tap and die set, adjustable wrench, iron pipes, pipe dope or teflon tape, steel brush, can of rust solvent

TASK STEPS:

A.
1. Put pipe in vice or secure with pipe wrench.
2. Remove burrs from inside end of pipe.
3. Choose correct die.
4. Put die in handle.
5. Hold die against end of pipe and turn and turn handle clockwise to start die.
6. After die starts, put cutting oil on die cutters.
7. Continue to turn handle clockwise and add cutting oil.

B.
1. Turn off water.
2. Clean threads and check for damage.
3. Put pipe dope or teflon tape on.
4. Start fitting by hand,, turning clockwise.
5. Finish tightening with pipe wrench.

(continued on next page)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 01

TASK STEPS:

C. 1. Clean dirt from fitting.
   2. Put fitting in vice.
   3. Choose correct tap.
   4. Put oil on old threads and tap.
   5. Give tap 2 or 3 turns and then back tap off.
   6. Remove any pieces of dirt and chips and then repeat step number 5 until threads are like new.

D. 1. Put pipe on vice.
   2. Spray threads with solvent.
   3. Choose right die and put in wrench.
   4. Put die on thread and make 3 to 4 turns.
   5. Back die off and make 6 to 7 turns and oil die.
   6. Continue until threads are clean.
   7. Brush off threads.
   8. Put oil on threads.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook- Complete Do-it-Yourself Manual
Do-it-Yourself Plumbing

LEARNING ACTIVITIES

1. Look at pictures of tools and equipment you will use to do Task# 01. See your textbook pgs. 227 and 229.

2. Read new words that will be presented in this task. See Information Sheet pg. 01-1.

3. Read process for cutting and threading pipes. See Information Sheets pgs. 01-2 and 01-2a.

4. This task is in four parts. The parts are marked "A", "B", "C", and "D". Read all information listed in part "A" only. See Competency Sheet in this guide.

5. Ask teacher to demonstrate this part of Task# 01. See teacher.

6. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS". (part "A" only).

7. Now read all information listed in part "B" of Task# 01. See Competency Sheet in this guide.

8. Repeat step numbers 5 and 6 on this paper. Do part "B" only.

9. Read information on parts "C" and "D" of Task# 01 as you did for parts "A" and "B". See Competency Sheet in this guide.

10. Repeat step numbers 5 and 6 of this paper for each of these parts of TASK# 01.

11. Fill-out checklist to see if you have completed Task# 01 correctly. Student Evaluation Checklist in this guide.

12. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Are threads smooth and aligned with no burrs and nicks on them?		
2. Is the pipe die in good condition with no damage to die?		
3. Are the threads of the correct length for the joint to be made?		
B. 1. Are the threads in good condition with no stripped threads?		
2. Are you sure there are no leaks?		
C. 1. Are you sure there are no stripped threads or cross cut threads?		
2. Are you sure the fittings do not leak?		
D. 1. Are threads clean with no rust, dirt or paint?		
2. Are you sure there are no cross cut threads?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-2 C-2 D-2
TOTAL POINTS POSSIBLE = A-3 B-2 C-2 D-2

TASK# 01

INFORMATION SHEET 01-1
(STUDY WORDS)

shallow-- not deep

burrs and nicks-- bumps and cuts (on a pipe)

cutting oil-- oil used to lubricate a die

solvent-- a type of cleaner

oil can spout-- lip or tube on can from which oil comes out

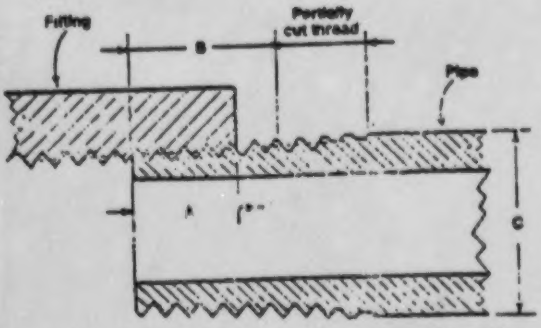
catch pan-- pan put under work you are doing to collect oil that can fall to floor

stripped threads-- threads that are no good because they are smooth and worn

cross cut threads-- threads that are not even because thay are cut wrong

joint-- the point or place where two sections of pipe meet together with a fitting between them

cross section cut of a pipe-- a cut made through the length of a pipe to better show what the complete pipe is like



Cross section of a standard pipe thread, with major dimensions as shown in table below.

pipe dope-- a paste put on pipe threads before screwing on pipe fittings Then water doesn't leak from joint

teflon tape-- a tape used sometimes instead of pipe dope

a partial turn-- an incomplete turn

clockwise-- to turn something in the same direction that the hands of a clock move (left to right)

INFORMATION SHEET 01-1a

(STUDY WORDS)

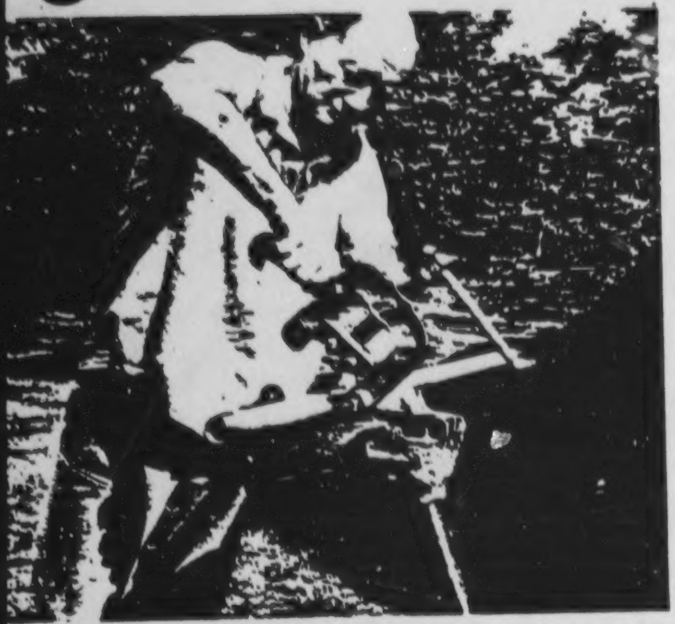
counter clockwise	- To turn something in the opposite direction from which the hands of a clock move. (right to left)
even	- equal or smooth
uneven	- ragged or unequal of rough.

(VERBS)

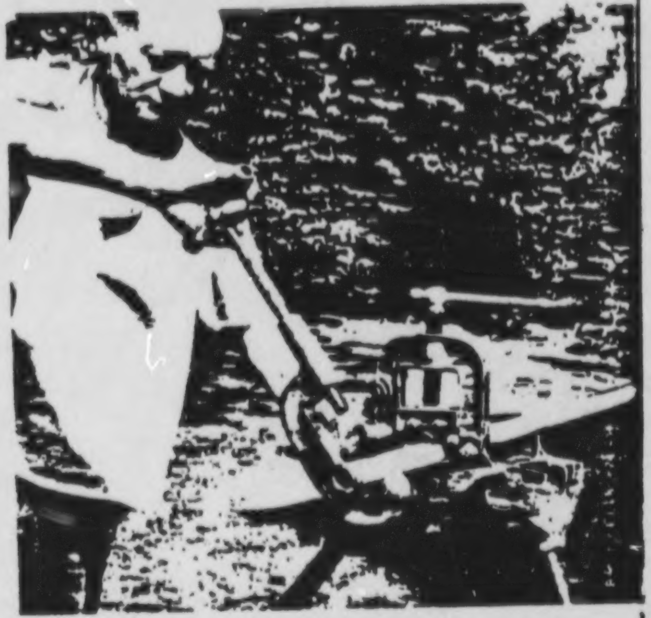
To rest	- to lie of set in a position
To back off	- to move back or in an opposite direction.
To seal	- to close completely.
To join	- to bring in contact with something else.
To flush	- to spray with a lot of water or other liquid.
To renew	- to make new again.
To align	- to bring into a straight line or correct co-ordination.

INFORMATION SHEET 01-2

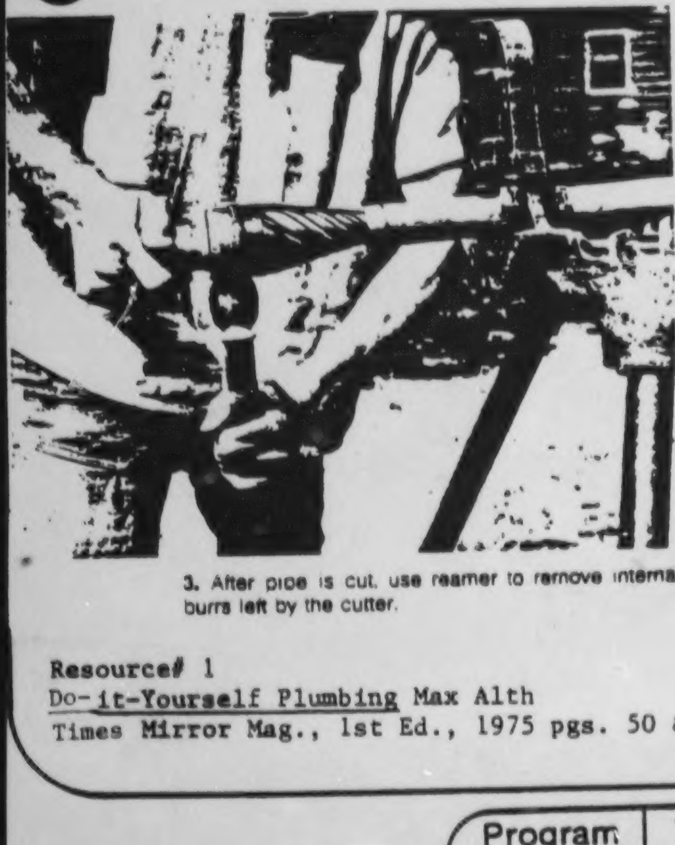
Cutting and Threading Pipe



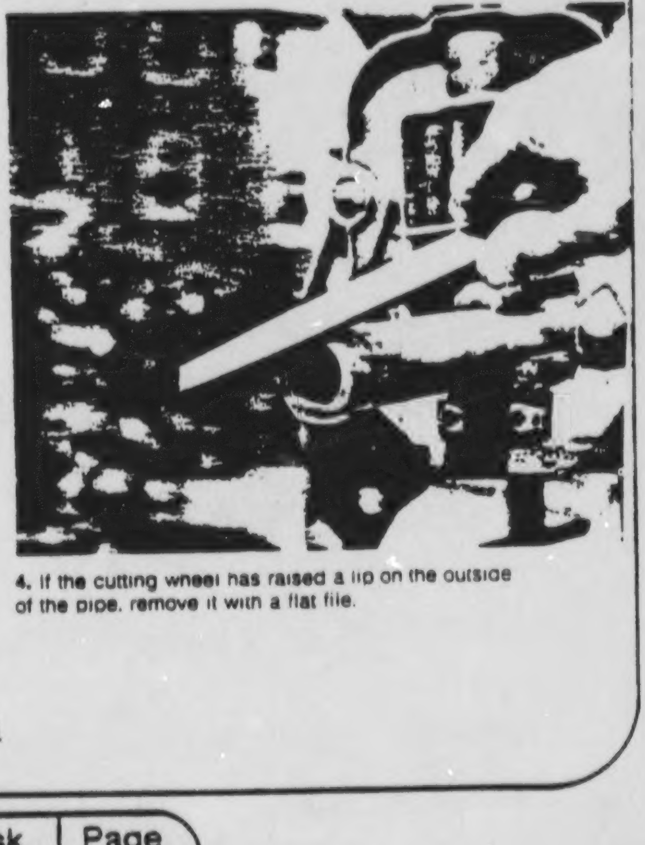
1. Put the pipe in a vise, measure the length you want to cut, and mark the pipe.



2. Place the cutter on the pipe and turn handle, bringing the cutting wheels against the line of cut.

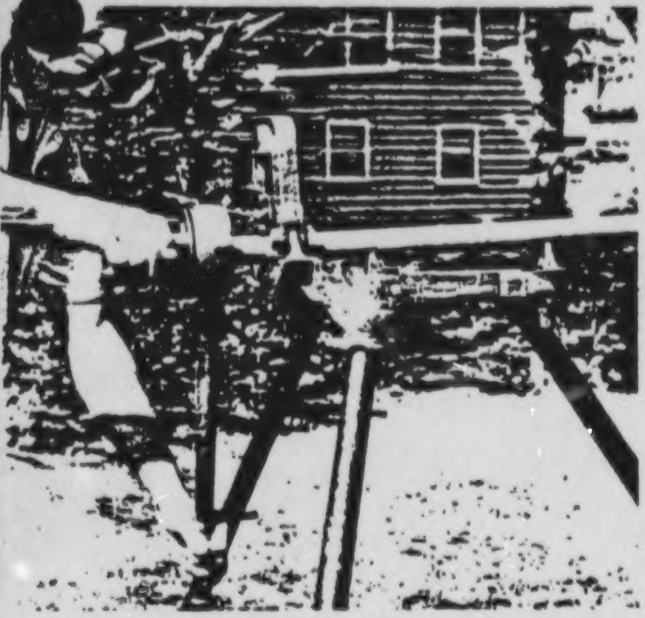


3. After pipe is cut, use reamer to remove internal burrs left by the cutter.

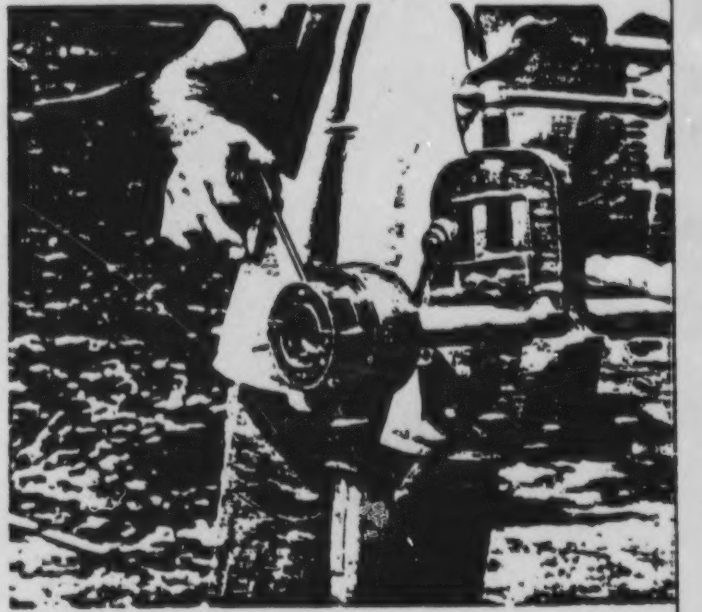


4. If the cutting wheel has raised a lip on the outside of the pipe, remove it with a flat file.

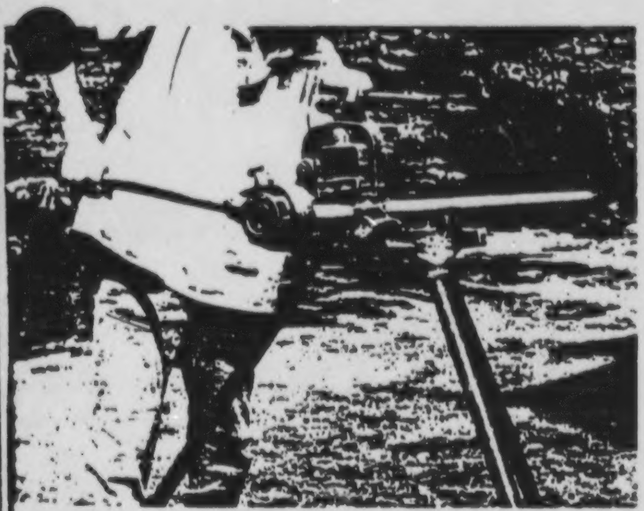
Resource# 1
Do-it-Yourself Plumbing Max Alth
Times Mirror Mag., 1st Ed., 1975 pgs. 50 & 51



5. Slip the threading die over the end of the pipe, making sure the guide, or bushing, goes first, and rotate the handle.

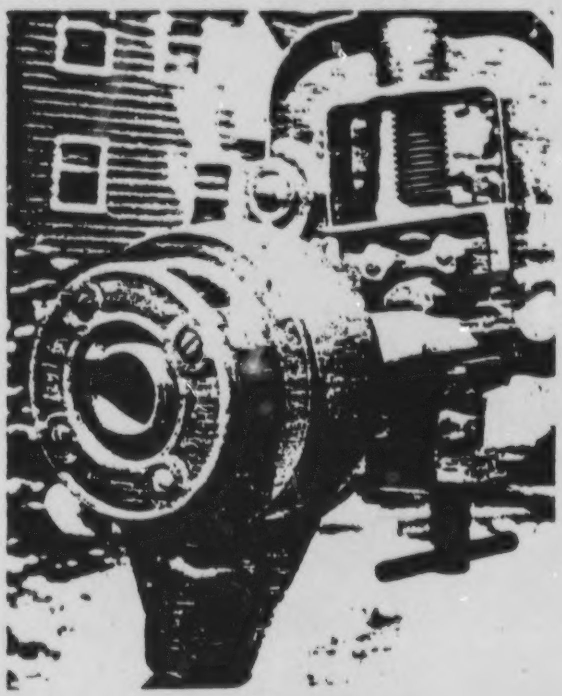


6. Stop every once in a while to give the die and partially cut thread a shot of cutting oil.



7. If you are using a ratchet stock, as shown, continue slowly in the same direction, stopping frequently to lubricate the die. If you are using a two-handed stock, you can back up a fraction every once in a while to clear the chips.

8. Stop when the end of the pipe is flush with the outer surface of the die, as shown. (With some pipe threaders, pipe should extend two threads beyond die.)



Resource# 1 (continued)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Join copper tubing by sweating, compression and flare joints

TASK NO: 02

STUDENT WILL:
A. Sweat solder copper tubing
B. Join copper tubing by compression method
C. Join copper tubing by flare method

GIVEN: Two pieces of copper tubing to be soldered.
Two pieces of copper tubing to be joined by compression.
Two pieces of copper tubing to be joined by flare method.

TOOLS & EQUIPMENT: propane torch, hacksaw, or tube cutter, soldering iron, solder, copper connections, two adjustable wrenches, 8 or 10 inch mechanical or manual flaring tool, hammer.

TASK STEPS:

A. 1. Cut tubing.
2. Ream ends.
3. Clean inside and outside of ends with sandpaper or steel wool.
4. Clean the inside and outside of the fittings with sandpaper also.
5. Flux places where solder is to go.
6. Heat tube area to be soldered.

B. 1. Read directions on compression ring package.
2. Slide fitting onto threaded end of tubing.
3. Slide compression ring onto end of tubing.
4. Push fitting onto end of tubing.
5. Hold fitting firmly on end of tubing and slide compression ring and nut up to fitting.
6. Turn clockwise to start.
7. Tighten nut.
8. Repeat operation from step numbers 1 to 5 in part "B" until fitting is installed.

(continued on next page)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 02

C. 1. Slide flare nut onto tubing with threaded end toward fitting.
   2. Place tubing about 1/8 of an inch into flaring tool.
   3. Slide tapering tool into base and tighten.
   4. Remove flaring tool.
   5. Holding fitting against flare, slide flare nut onto fitting and tighten by hand.
   6. Tighten flare nut.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook - Complete Do-it-Yourself Manual
Do-it-Yourself Plumbing

LEARNING ACTIVITIES

1. See information on sweating tools and equipment. See textbook pg. 230.

2. Read new words that will be presented in this task. Information Sheet 02-1.

3. This task is in three parts. The parts are marked "A", "B". and "C". Read all information listed in part "A" only. See Competency Sheet in this guide.

4. Read information to learn about process described in part "A". See Information Sheet pg. 02-2 in this guide.

5. Ask teacher to demonstrate this part of Task# 02. See teacher.

6. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS". (part "A" only)

7. Now read all information listed for part "B" of Task# 02. See Competency Sheet in this guide.

8. Read information to learn about metal-ring compression joints. See Information Sheet pg. 03-3 in this guide.

9. Repeat step numbers 5 and 6 of this paper. Do part "B" only.

10. See pictures of flaring tools and equipment. See textbook pg. 231.

11. Read all information listed in part "C" of Task# 02. See Competency Sheet in this guide.

12. Repeat step numbers 5 and 6 of this paper for part "C".

13. Fill-out checklist to see if you have completed Task# 02 correctly. See Student Evaluation Checklist in this guide.

14. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	RATING NO
A. 1. Did solder flow?		
2. Did solder stick to copper tubing and not run off?		
3. Were joints completely filled with solder?		
4. Did most of the solder go on the pipe and not on the floor?		
B. 1. Were the flange nut and compression ring put on the tubing in correct order?		
2. Are all the threads cut even?		
3. Are all the threads in good condition?		
C. 1. Does the flare have a conical and round?		
2. Are the threads even on the inside of the flare nut?		
3. Was the coupling put on tightly with no stripped threads on the flare nut?		
4. Is the pipe joint dry with no leaks?		

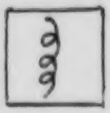
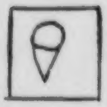
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-4 B-3 C-4
TOTAL POINTS POSSIBLE = A-4 B-3 C-4

TASK# 02

INFORMATION SHEET 02-1

STUDY WORDS:

melted	-something that is changed from solid to liquid using heat
soldering	-a process in which a mixture of metals are melted and used for joining together solid metal parts
solder	-the mixture of metals used in soldering. Lead and tin are metals often used
sweat soldering	-a process in which solder is used to seal the joint between a piece of copper tubing and a fitting
oxides	-an element mixed with oxygen it causes metals to rust or change color
spiral wire 	-a single wire that is formed into winding circles
reamer	-a tool used to clean or remove material from inside a tube or other object
surfaces	-the outside parts of an object. Any of the faces of a solid object
sandpaper	-rough paper used to make surfaces smooth
steel wool	-many thin strings of metal joined together in the shape of a pad or ball. It is used to make surfaces smooth
flux	-a kind of cleaner
conicial shape 	-in the shape of an ice cream cone

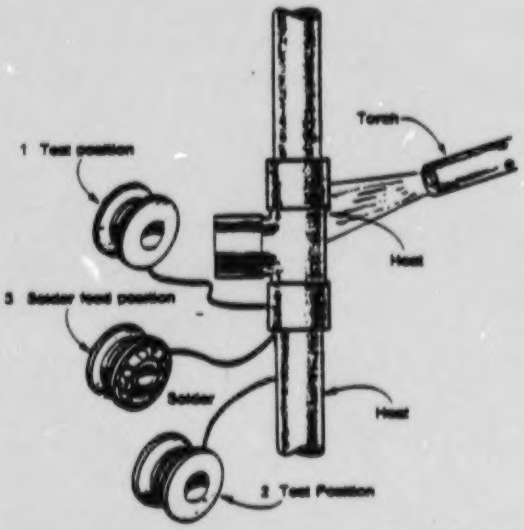
Sweating a joint. Begin by slipping the fitting to be sweated over the pipe end to make certain there are no bumps or kinks that will prevent a good solder joint. If a valve is to be sweated, the valve should be taken apart and its stem, along with its washer, removed. Placing a damp rag on a valve doesn't work; the water keeps the valve cool and prevents the solder from properly melting. Now disassemble the dry joint.

Clean the outside of the last inch of pipe with fine sandpaper or fine steel wool; also clean the inside end of the fitting. Apply flux to both the pipe and fitting, and assemble the two pieces. *Do not hold the joint*, even at a distance down the pipe. Copper is an excellent conductor of heat and you may burn yourself, or drop the joint and ruin it. Support the pipe on bricks or hold it in a clamp or a vise.

Apply the flame of the torch to the heaviest piece of metal. Torch flame is hottest a couple of inches in front of the nozzle. When you believe the heaviest piece of metal, which in most cases would be the fitting or the valve, is hot enough, shift the torch to the pipe. Don't play the flame at the edge of the joint, but about an inch away. If there are two or more pipes, concentrate on one at a time. Do not try to make all the joints at once. Test the temperature of the fitting by touching the solder wire's tip to it. If it melts, it is hot enough. Now play the flame over the pipe about an inch from the fitting end. Try to avoid heating the flux itself. At no time play the flame on the solder itself or touch the solder to the spot just heated by the flame; you will get a false reading.

When both the fitting and the pipe are hot enough, as evinced by readily melted solder, bring the flame back on the fitting, away from the end, and press the tip of the solder against the crack between the pipe and the fitting. As the solder melts, capillary action will draw it inside the crack. Keep feeding the solder until a ring of solder appears around the joint edge. Now, without pausing, go on to heat and solder the second and third pipe that may join the fitting.

When the bright circle of molten lead appears all around the pipe at the edge of the joint, the joint is filled with lead. It is com-



Sequence of soldering procedure is shown in this drawing. (1) The heavy part, the fitting, is always heated first and the temperature measured by touching it, on opposite side, with the tip of the solder. If solder melts, the fitting is hot enough. (2) The lighter part, the pipe, is heated next, and again temperature determined with tip of solder. (3) When both parts are hot enough to easily melt the solder, the tip of the solder is pressed against the joint until enough molten metal has been drawn inside to fill the space between pipe and fitting.

Resource# 1

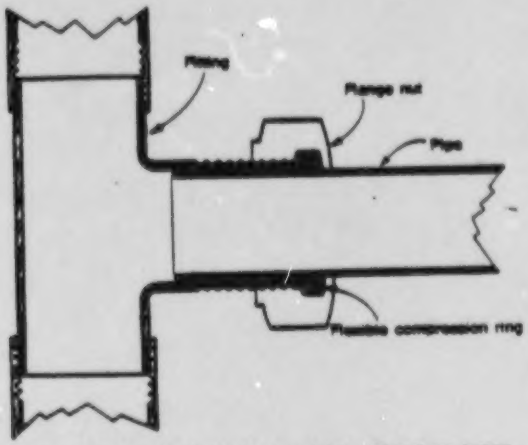
Do-it-Yourself Plumbing - Max Alth

Times Mirror Mag., 1st Ed., 1975 pgs. 62 & 63

Metal-ring Compression Joints

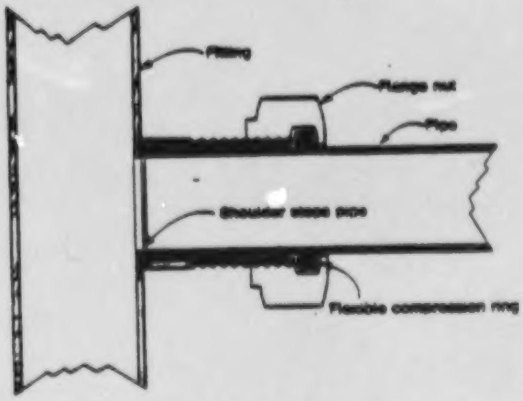
Two lengths of copper tubing can be joined by means of a metal-ring compression joint. This joint consists of a flange nut, a metal ring, and a fitting, which may be a coupling, Tee, elbow or part of a valve. To make the joint, cut the tubing to the length you require, taking care to make the cut just as square as you can. Next, remove all external and internal burrs from the tube end. Slip the flange nut and the metal ring over the tube end. Now insert the tube end and metal ring into the fitting and screw the flange down over the ring and onto the fitting.

Resource# 1
(continued)



Cross section of a flexible-ring joint without an inner stop. This makes it possible to vary the depth the pipe enters the fitting.

Several types of joints are used. Examples are shown in the accompanying drawings. One is a slip joint. The other is on the same principle but doesn't permit the inner pipe to slip in and out of the fitting. The third utilizes a pipe with a preformed lip at its end. It is actually a kind of union.



Cross section of a flexible-ring joint with an inner stop. This limits the distance the pipe can enter the fitting, but makes for a "stiffer" joint.

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Repair valves and faucets

TASK NO: 03

STUDENT WILL:
- A. Repack stuffing box in gate valve
- B. Replace faucet washer
- C. Repair compression faucet

GIVEN:
- A. A leaking gate valve.
- B. A leaking faucet.
- C. A leaking compression faucet.

TOOLS & EQUIPMENT: regular and phillips screwdriver, adjustable wrench, several different gaskets, faucet reamer, washers, channel locks

TASK STEPS:

A. 1. Shut-off water at nearest location to leaking valve.
   2. Remove packing nut and valve stem.
   3. Remove old packing.
   4. Install new packing.
   5. Replace valve stem and packing nut.
   6. Turn on water.
   7. Check job for leaks.

B. 1. Turn off water nearest to location of repair area.
   2. Remove cap and remove screw holding handle on spigot.
   3. Remove handle.
   4. Remove nut holding spigot stem in spigot base
   5. Remove spigot stem.
   6. Remove screw from bottom of spigot.
   7. Put in new washer.
   8. Inspect seat in spigot base for dirt and worn seat base.
   9. Ream valve stem seat.
   10. Put all parts together again.
   11. Turn on water (charge line).

C. 1. Carry all tools and equipment to work place.
   2. Shut off water to fixture.
   3. Remove handle. Loosen screw in tip of handle and carefully raise or pry handle from stem.

continued on next page

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 03

TASK STEPS:

C. 4. Unscrew lock nut.
   5. Unscrew stem or spindle from faucet.
   6. Remove screw at end of spindle and take off washer.
   7. Replace any worn washers.
   8. Choose new washer (same kind and size) and put flat side of washer toward bolt head.
   9. Reassemble.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual
Good School Maintenance
Do-it-Yourself Plumbing

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 03-1.

2. See diagram of different types of valves. See Information Sheet pg. 03-2.

3. This is in three parts. The parts are marked "A", "B", and "C". Read all information listed in part "A" only. See Competency Sheet in this guide.

4. See pictures on repacking stuffing box in gate valve. See Information Sheets pgs. 03-3 and 04-4 in this guide.

5. Ask teacher to demonstrate this part of Task# 03. See teacher.

6. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEP". (part "A" only)

7. Now read all information listed in part "B" of Task# 03. See Competency Sheet in this guide.

8. See drawings of washer-type faucet. Textbook pg. 219.

9. Repeat step numbers 5 and 6 on this paper. Do part "B". See Competency Sheet.

10. Read all information on part "C" of Task# 03 as you did for parts "A" and "B".

11. Repeat step numbers 5 and 6 on this paper for part "C".

12. Fill-out checklist to see if you have completed Task# 03 correctly. See Student Evaluation Checklist in this guide.

13. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Are you sure there are no leaks?		
2. Are the threads on fittings even with no cross cut threads?		
3. Do fittings reseat to fullest amount?		
B. 1. Does handle turn easily?		
2. Did you check and make sure that the fauceet does not leak?		
3. Is the faucet in good condition with no marks or damage?		
C. 1. Do the handles point at equal angles when in the "off" position?		
2. Does the water run then stop running in an even way when turned on and off?		
3. Are you sure that water does not drip from the faucet?		
4. Are you sure there are no leaks around connecting parts?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-3 C-4
TOTAL POINTS POSSIBLE = A-3 B-3 C-4
TASK# 03

INFORMATION SHEET 03-1

STUDY WORDS:

bathroom fixtures	- faucets and handles on toilet, sink and bathtub
stuffing box	- area between the valve stem and the faucet body (See Information Sheet 03-2)
worn	- to lose thickness or height from use
toward	- in the direction of something; pointing at something

VERBS:

To drip	- to fall in drops
To replace	- to put something in the same place again or put a new one in its place
To repack	- to pack again
To pry open	- to open by raising one side first and then the other side
To reassemble	- to put together
To seat	- to put or set in or on something
To reseat	- to seat again
To compress	- to press or squeeze together
To inspect	- to look at carefully
To flow	- to move as a liquid

EXPRESSIONS:

trouble shooting	- locating or finding a problem and then repairing it

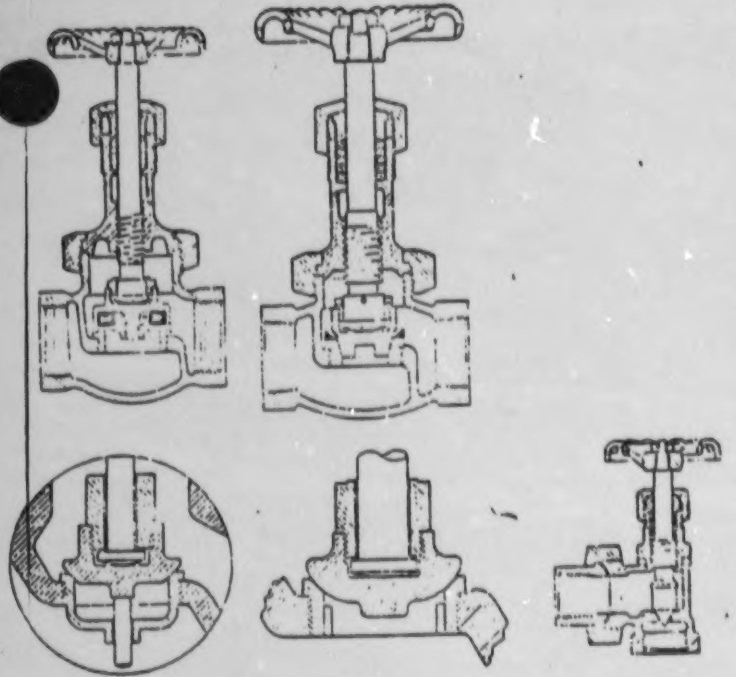


FIGURE 33—Globe valves. Bronze disc globe valve (top left) has disc that is easily replaced. Plug disc design (top right) is one of several similar popular designs. Narrow conical seat globe valves come in two designs. In one (lower left) the disc seating surface has the same angle as the body seat; in the other (lower center) the disc seating surface is curved. Needle valve (lower right) is also called an expansion valve.

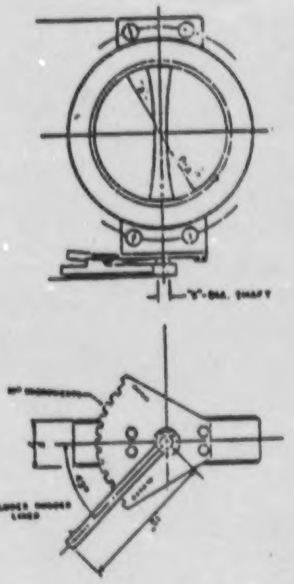


FIGURE 34—Butterfly valve.

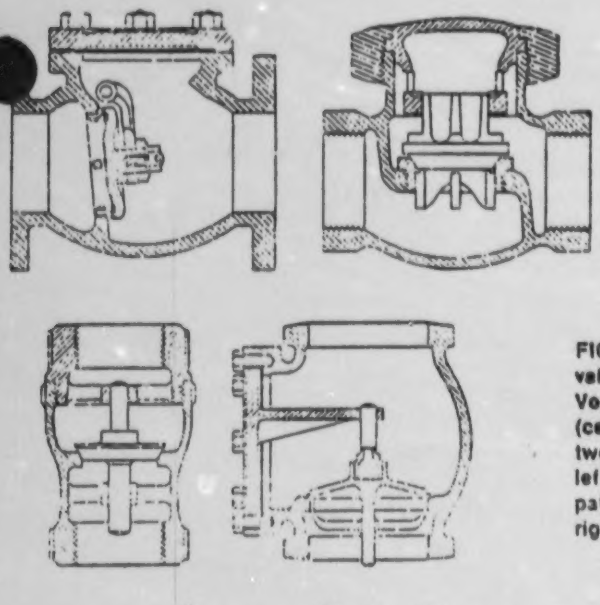
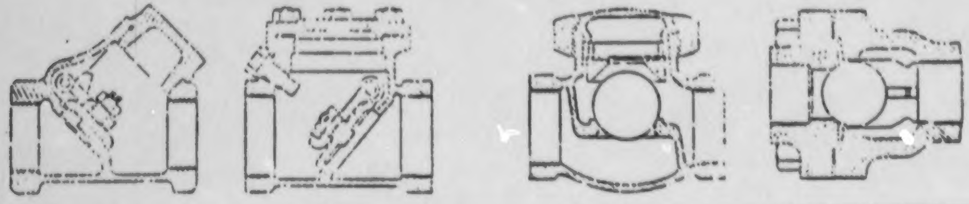


FIGURE 35—Check valves. Swing check valve (top left). Life check valve (top right). Vertical check valves include brass type (center left) and iron body (center right). The two small brass swing check valves (lower left) include a "Y" pattern and a regular pattern. The two ball check valves (lower right) are for horizontal lines only.



Resource# 1
Good School Maintenance
IASB Service Associates, 1st., Ed,
1976 pg. 74 & 75

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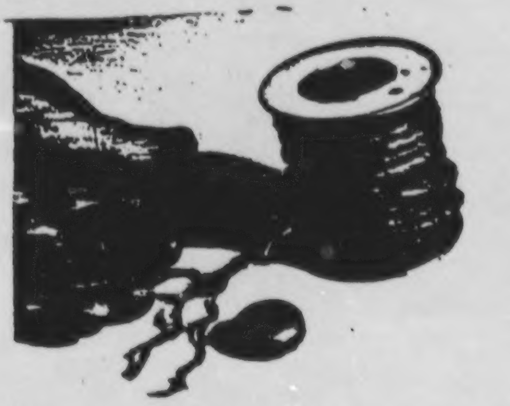
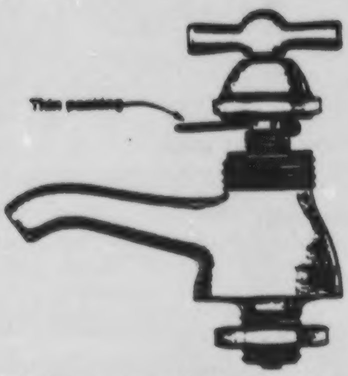
INFORMATION SHEET 03-3

packing thread
used to repack stuffing
box in gate valve.



Commercial thread packing and a preformed washer packing. The thread is normally too thick to use in a faucet and must be unraveled.

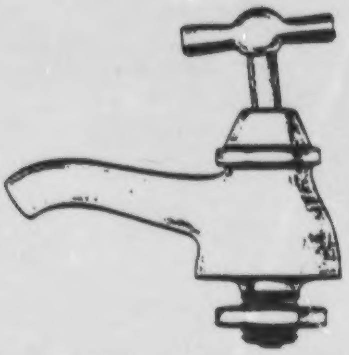


If you can raise the packing nut high enough, you don't have to remove the faucet handle to replace the packing. Use packing thin enough to go around the stem several times. Wind in the same direction that the stem revolves when closing the faucet.

Commercial "thread" packing is too thick for most of the faucets encountered in the home. It should be unraveled and a thread thin enough to go around the valve stem several times before filling the space should be used. Do not use one short piece of packing that is so thick it cannot be overlapped. A leak can occur between the butting ends.

If the valve used washer-type packing, secure some from a plumbing supply house or adapt the thread packing to the job. If you have washer-type packing, and it fits, it can usually be used in place of the string. And if you have no commercial packing, you can make do with cotton thread rubbed generously in candle wax.

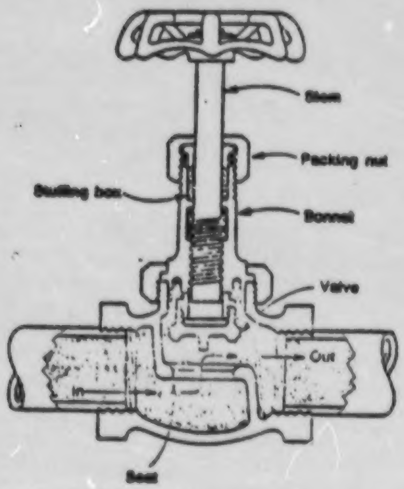
Incidentally, when the old packing is out and the valve stem is exposed, examine it for burrs and straightness. If it has been roughened or bent, the packing will be short lived. When the stem is badly worn or bent, no amount of packing will prevent it from leaking. You will find that worn stems can be tilted from side to side; that the portion making contact with the packing is worn and slightly grooved. Worn stems must be replaced. Many of the plumbing supply houses carry an assortment of replacement stems. If the valve itself can be easily replaced, it is advisable to replace the entire valve or faucet, rather than the stem alone. The reason is that the valve body, which carries the coarse threads on which the stem rides, also wears. While the new stem will not "tilt" as much as the old stem, it still will tilt because the threads and cap nut are worn.



When you can tilt the faucet stem this way in the open position, it is best to replace the entire faucet. If that is not practical, replace the stem. Tilting faucets always leak at their stems.

Resource# 2
Do-it-yourself Plumbing
Times Mirror Mag., 1st Ed.,
1975. pg. 91

Program	Task	Page
	03	3



Interior view of a large globe valve. All globe valves have the same parts arranged in the same way.

GATE VALVES

A gate valve incorporates a "gate" which is lowered, by turning the valve handle, into a position between the valves inlet and outlet ports. The sides of the gate are tapered to mate tightly with two valve seats, one on either side. When the control wheel or handle is turned—and it must be turned several times—the gate is lifted clear of both ports.

Gate valves are used to shut off the flow of a liquid or a gas. They are not used to vary the flow, so they are not operated in the half-open position. The gate itself is a finely machined double-faced piece of metal. It seals by metal-to-metal contact. As there is almost no resilience, water flowing forcefully over the gate can easily scour it and the seat. The valve would then leak, necessitating complete replacement of the valve or remachining of the valve surfaces.

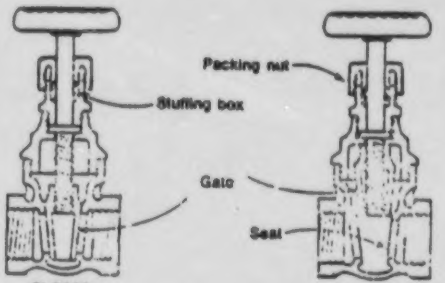
Gate valves are used in main pipe runs where there is no need for partial flow. Their advantage over globe valves is reduced friction. Water passing through a globe valve has to make two turns and pass through an orifice, generally smaller than the feed-pipe diameter. Passage through an open gate valve is almost free and clear.

Gate valves are found in the main line of a hot-water heating system, where the valve is closed in the summer and opened —all the way—in the winter. Gate valves are sometimes used in individual feed pipes leading to steam radiators.

A gate valve can usually be identified by its unusually large bonnet. Also, a gate valve usually must be turned a few times before you can feel anything happening inside. Globe valves respond faster. But once a gate valve is disconnected from its pipe, it is easy to peer inside and see the gate.

If there is a leak at the stem, tighten the cap nut and/or replace the packing. A gate valve's stem is identical in this respect to that of a globe valve.

If you cannot shut the valve completely, the gate and/or the gate seats are worn. There is no way to reface the seats and gate with hand tools. The entire valve must be replaced. However, it is worth your time to take the valve apart to make certain dirt isn't keeping it from closing completely.



Interior view of large gate valve. Valve takes its name from the "gate" that moves up and down. You can usually recognize a gate valve by its large bonnet.

Resource# 2 (continued)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Repair leak in ball cock valve

TASK NO: 04

STUDENT WILL: Repair a leak in ball cock valve

GIVEN: A leaking ball cock valve in a toilet tank, supplies and equipment.

TOOLS & EQUIPMENT: adjustable wrench, regular screwdriver, steel wool, or soft wire brush, detergent

TASK STEPS:

1. Turn off water to toilet tank.
2. Remove float arm and ball.
3. Remove screws of bolts holding valve plunger.
4. Remove ring and washer form valve plunger.
5. Clean valve parts.
6. Replace washer and "o" ring with new ones.
7. Reinstall valve plunger.
8. Reinstall float arm and ball.
9. Run on water (charge line).

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual
Do-it-Yourself Plumbing

LEARNING ACTIVITIES

1. Read and Study new vocabulary that will be presented in this task. See Information Sheet 04-1 in this guide.

2. See Information on how a toilet works. See information Sheets 04-2, 04-2a in this guide. Also, pgs.222 & 223 in your textbook.

3. Read all information about Task# 04. See Competency Sheet in this guide.

4. Ask teacher to demonstrate process of repairing a leak in ball cock valve. See teacher.

5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEP".

6. Fill-out Checklist to see if you have completed Task# 04 correctly.

7. Give completed Student Evaluation Checklist to teacher.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are you sure there are no leaks?		
2. Does the toilet work okay?		
3. Does the stopper ball seat work okay?		
4. Is the shut-off gradually done?		
5. Does the flush handle operate easily?		
6. Is the water height in tank correct?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 04

INFORMATION SHEET 04-1

STUDY WORDS

commode or water closet - a toilet

flush mechanism - moving parts connected to flush handle on toilet

upward - in a higher place or position

downward - in a lower place or position

gradually - slowly

partially full - not completely full

VERBS

To flush toilet - to operate handle on toilet to make water inside toilet flow downward

To reinstall - to put in position again

To ascend - to move up

To descend - to move down

To adjust - to change the position of something to make it fit correctly

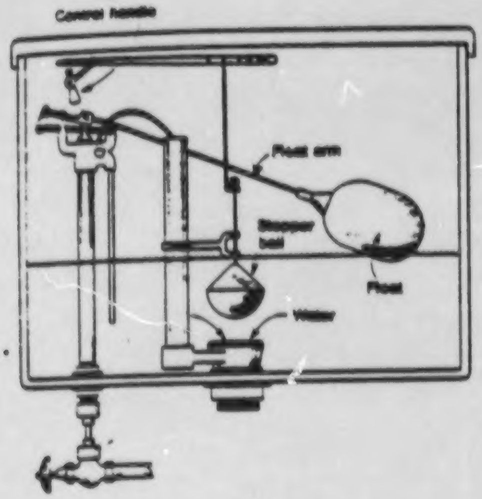
To unscrew - to loosen and remove a screw

EXPRESSION

To work freely - to operate easily

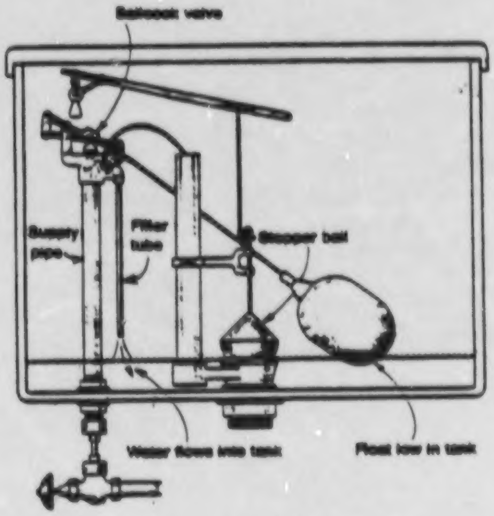
INFORMATION SHEET 04-2

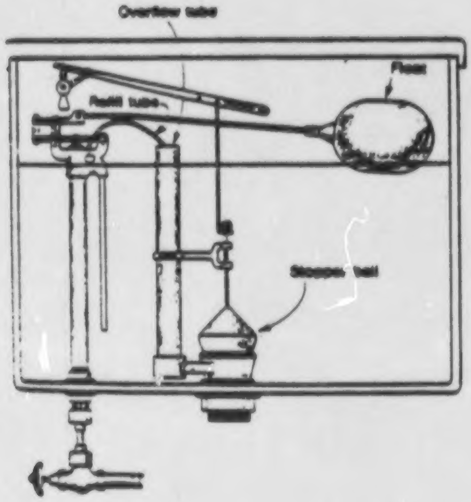
How a Toilet Works


Control handle
Float arm
Stopper ball
Float
Water

1. When the control handle is operated, the linkage raises the *stopper ball* from its seat, permitting water to pour out of the tank and into the toilet bowl. The *float* descends as the water level drops.

2. The descending float opens the *ballcock valve*, and water from the *supply pipe* is released through the *filler tube* and into the tank. The control handle has been released, allowing the *stopper ball* to settle into its seat and close the tank.

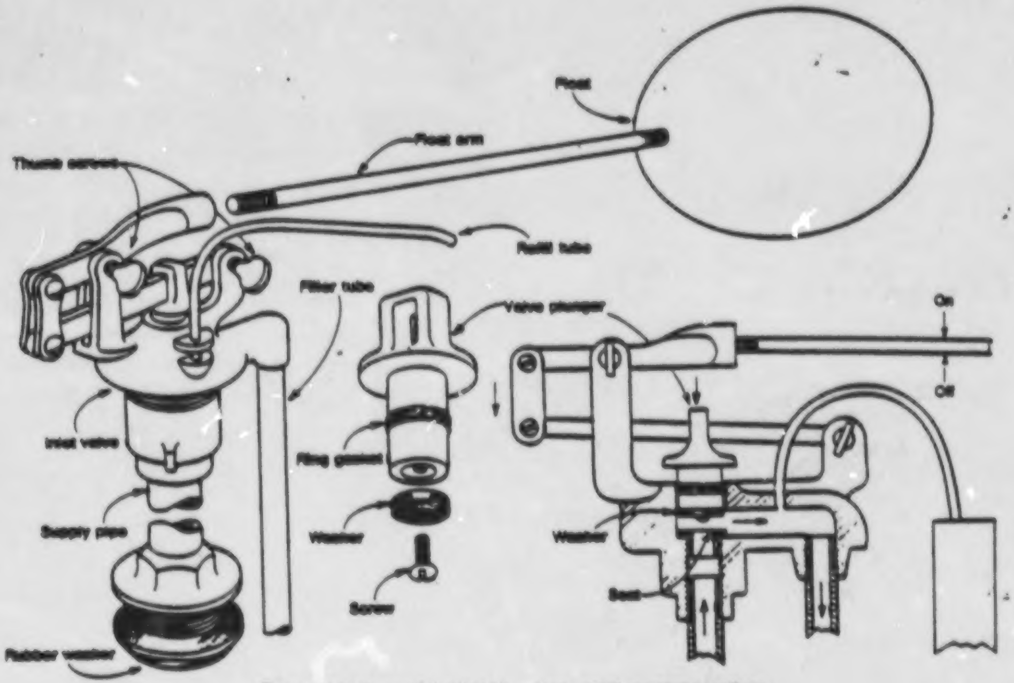

Ballcock valve
Supply pipe
Filler tube
Stopper ball
Water flows into tank
Float low in tank


Overflow tube
Float
Refill tube
Stopper ball

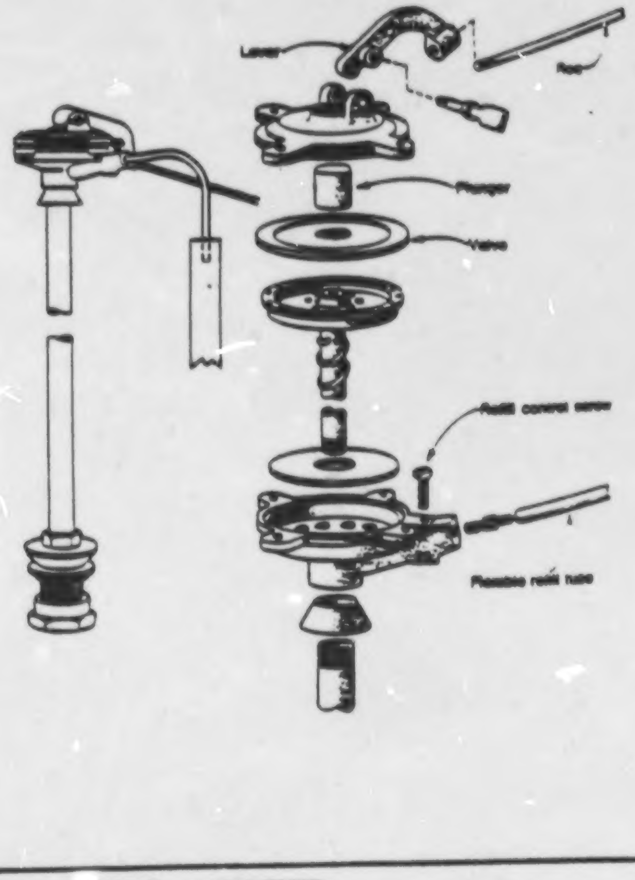
3. As the tank fills with water, the float ascends, closing the ballcock valve and shutting off the flow of water into the tank. If, for some reason, the ballcock valve does not close, the water will continue to rise until it can be drained off by the *overflow tube*. Meanwhile, the toilet bowl, which has been emptied, is partially filled again by the *refill tube*, which directs water into the overflow tube as the tank is filling.

Resource# 1
Do-it-Yourself Plumbing Max Alth
Times Mirror Mag., Inc. Ed, 1975, pg. 111 & 112

INFORMATION SHEET 04-2a


Float
Float arm
Thumb screws
Refill tube
Filler tube
Valve plunger
On
Off
Inlet valve
Ring gasket
Supply pipe
Washer
Screw
Washer
Seat
Rubber washer

Exploded view of ballcock valve used on most toilets.


Lever
Rod
Plunger
Valve
Refill control screw
Flexible refill tube

Major parts of a diaphragm-valve ballcock assembly. When rod is lifted upward by attached float (not shown), plunger pushes valve down against its seat, which is at the top of the single pipe that supports the mechanism and brings the water in. To adjust water level in toilets using this valve, bend the rod as you would with a ballcock valve.

Resource# 1 (continued)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Install commode, wax seal, and seat

TASK NO: 05

STUDENT WILL: A. Replace a wax ring gasket
B. Replace a toilet seat

GIVEN: A commode. tool, and equipment.

TOOLS & EQUIPMENT: adjustable open end wrench, box end wrenches, cloth pads, mirror, and socket set

TASK STEPS:

A. 1. Shut off water to commode and drain lines.
2. Remove bolts holding commode to floor.
3. Grasp commode bowl and shake slightly.
4. Lift tank slightly and pull commode forward.
5. Lift commode away from closet bend. Turn commode upside down. NOTE: Take care to put commode upside down
6. Clean old wax ring from closet bend.
7. Clean commode flange.
8. Replace wax ring over rim of commode.
9. Set commode back on soil pipe collar.
NOTE: Do not move commode after setting it down.
10. Tighten bolts.
11. Replace gasket on connection between commode and tank of flush valve to bowl, using slip nut and washer.
12. Connect flush valve to water supply line or water line to tank.
13. Test for leaks.

B. 1. Assemble tools and equipment.
2. Check nuts holding hinge bolts and nuts.
3. Spray penetrating oil on hinge bolts and nuts.
4. Remove nuts on old toilet seat and lift seat off.
5. Replace with new seat.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each Checklist.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new vocabulary that you will use in this task. See Information Sheet pg. 05-1.

2. See pictures of tools and equipment you will need for this task. See you textbook pg. 23, 236, and 237.

3. This task is in two parts. The parts are marked "A" and "B". Read all information in part "A" only. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 05. See teacher.

5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS". (part "A" only)

6. Read all information in part "B" of Task# 05. See Competency Sheet in this guide.

7. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

8. Fill-out Checklist to see if you have completed Task# 05 correctly. See Student Evaluation Checklist in this guide.

9. Give completed checklist to teacher to check.

STUDENT EVALUATION SHEET

ITEMS TO BE CHECKED	RATING YES	RATING NO
A. 1. Is bowl set firmly on the floor so that the bowl doesn't move?		
2. Is the area dry with no leaks?		
3. Is the commode in good condition with no damage to surfaces?		
B. 1. Is the seat on tight?		
2. Is the commode in good condition with no damage to surfaces?		
3. Do the lid and seat go up and down easily?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-3
TOTAL POINTS POSSIBLE = A-3 B-3

TASK# 05

INFORMATION SHEET 05-1

STUDY WORDS:

circular	- round shape
rim	- the lip or border of something
lid	- cover on a seat
slightly	- a little bit or not much
securely	- in a strong and safe way
a hinge	- a mechanical part on which a toilet seat swings up and down
forward	- to move to the front

VERBS:

To grasp	- to hold securely
To drain	- to empty the water
To tighten	- to make tight

EXPRESSIONS:

turn upside down	- with the top side down so it points to the floor
take care	- to be careful
test for something	- check of a condition

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Cut metal tubing, plastic pipe and sheet metal

TASK NO: 06

STUDENT WILL:
A. Cut metal tubing
B. Cut plastic pipe
C. Cut sheet metal

CIVEN: Metal tubing, plastic pipe, sheet metal, and cutting equipment.

TOOLS & EQUIPMENT: tube cutter, hacksaw, folding ruler, vice, or other holding equipment, file, tin, or aviation snips, scratch awl, square or straight edge, rule, or tape measure

TASK STEPS:

A. 1. Measure and mark length to be cut.
   2. Place tube cutter wheel on mark where tubing is to be cut.
   3. Tighten blade against tubing.
   4. Turn blade around the tube until cutter rolls are free.
   5. Tighten and roll until tube is cut.
   6. Ream cut ends to remove burrs.
   CAUTION: Wear hand and eye protection.

B. 1. Measure and mark length to be cut.
   2. Put sheet metal on table.
   3. Put hacksaw on mark and cut.
   4. Ream cut edge.

C. 1. Put sheet metal on table.
   2. Measure and draw desired pattern.
   3. Cut along lay-out lines on metal.
   CAUTION: Use hand and eye protection.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook - Complete-Do-it-Yourself Manual

LEARNING ACITVITIES

1. Read new vocabulary that you will use in this task. See Information Sheet pg. 06-1.

2. See pictures of tools and equipment you will need for Task# 06. See your textbook tools-pgs. 24, 226, 420, 422. Equipment-pgs. 19, 232, 233, 436.

3. This task is in three parts. The parts are marked "A", "B", and "C". Read all information in part "A" only. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 06. See teacher.

5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS" (part "A" only).

6. Now read all information listed in part "B" of Task# 06. See Competency Sheet in this guide.

7. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

8. Read information listed in part "C" of Task# 06 as you did for parts "A" and "B". See Competency Sheet in this guide.

9. Repeat step numbers 4 and 5 of this paper. Do part "C" only.

10. Fill-out checklist to see if you have completed Task# 06 correctly. See "Student Evaluation Checklist" in this guide.

11. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	NO
A. 1. Is the metal tubing cut ± 1/16 of an inch of the length needed?		
2. Are all burrs cleaned out from the inside of the tubing?		
3. Is the cut end perfectly round?		
B. 1. Is the pipe end cut true?		
2. Are all burrs cleaned out from the inside of the tubing?		
C. 1. Is the sheet metal cut exactly on the lay-out lines?		
2. Are all sharp edges removed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-2 C-2
TOTAL POINTS POSSIBLE = A-3 B-2 C-2

TASK# 06

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Drain water from plumbing

TASK NO: 07

STUDENT WILL: Drain the water from plumbing

GIVEN: Plumbing system to be drained

TOOLS & EQUIPMENT: channel lock pliers, curb valve wrench

TASK STEPS:

1. Locate and uncover meter.
2. Cut water flow past meter.
3. Loosen drain valve.
4. Drain line.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual
Do-it-Yourself Plumbing

LEARNING ACTIVITIES

1. Look at pictures of home plumbing system. See your textbook pg. 213 and 214.
2. Look at picture of a channel type pliers used to do Task# 07.
3. Read all information listed for this task. See Competency Sheet in this guide.
4. Ask teacher to demonstrate Task# 07.
5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS".
6. Fill-out checklist to see if you have completed Task# 07 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did you find the closest shut-off to the problem area?		
2. Was valve shut-off correctly?		
3. Did water stop flowing through the faucets when you turned the faucets on?		
4. Did water stop flowing through any disconnected union when you shut the water off?		
5. Was line drained correctly?		

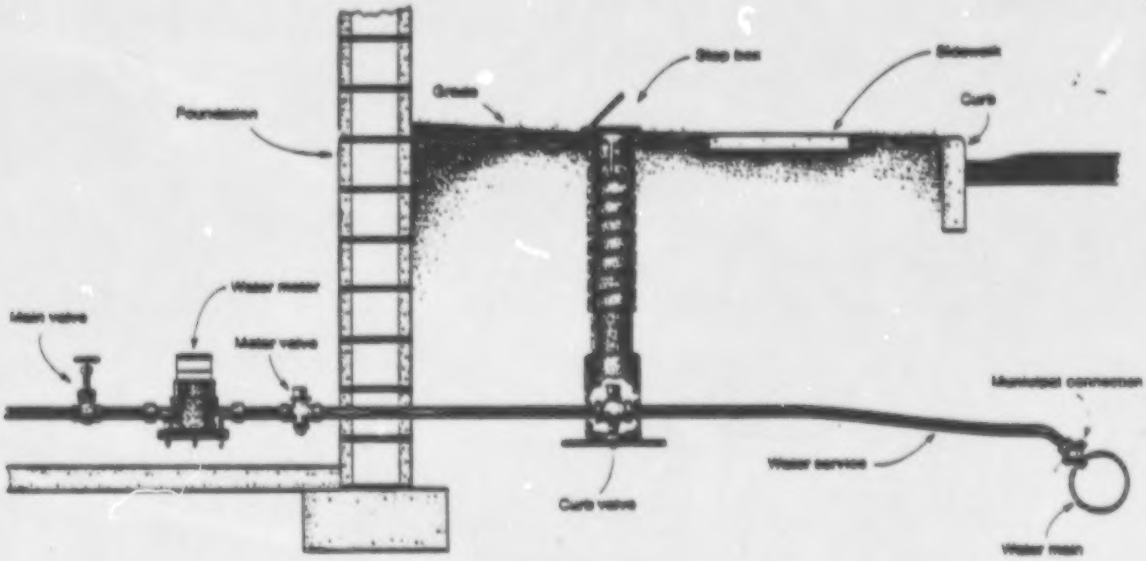
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 07

INFORMATION SHEET 07-1

2 YOUR HOME PLUMBING SYSTEM


Stop box
Sidewalk
Grade
Curb
Foundation
Water meter
Main valve
Meter valve
Municipal connection
Water service
Curb valve
Water main

Standard water-service installation. The city maintains water under constant pressure in its water main. From there the water flows through valves and the water meter into the house. Access to the curb valve is through the stop box.

NOTE:

Curb Valve Wrench - a long shaped wrench used by the water company to open a curb valve located outside your home. See curb valve in drawing above.

Resource
Do-it yourself Plumbing Max Alth
Times Mirror Mag. 1st Ed., 1975, pg. 2

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Open clogged drain using vacuum and chemicals

TASK NO: 08

STUDENT WILL: A. Open a clogged sink drair
B. Open a clogged sewer drain and suppliers

TOOLS & EQUIPMENT: vacuum plunger, bucket, chemicals, and funnel

TASK STEPS:

A. 1. Fill area above drain with water until plunger cup is partly covered.
2. Place cup over drain opening to form a vacuum.
3. Press plunger down hard until blockage is no longer a problem.
4. Test drain.
5. Clean and dry floor area around sink.

B. 1. Clean opening to drain.
2. Fill bucket half full with hot water to dissolve chemical in it.
3. CAUTION: Caustic solutions can burn skin and eyes. Wear hand and eye protection.
4. Pour solution slowly into drain hole and let stand.
5. Clean and dry floor area around sewer drain.
CAUTION: Caustic solutions can react with lead pipes. Caustics will damage the finishers on porcelain and enameled iron. Do not dissolve caustics in aluminum bucket. Set bucket with solution on heavy cardboard.
NOTE: Time is an important thing in this work. Take all the time you need.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of checklist.

RESOURCES: Textbook - Complete Do-it Yourself Manual

LEARNING ACTIVITIES

1. Read about process, tools and equipment used to clean out a drain. See your textbook pgs. 216 and 217.
2. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this part of Task# 08. See teacher.
4. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS". (part "A" only).
5. Read new words that will be presented in part "B" of this task. See Information Sheet 08-1 in this guide.
6. Read all information listed in part "B" of Task# 08 correctly. See Competency Sheet in this guide.
7. Repeat steps numbers 3 and 4 of this paper.
8. Fill-out checklist to see if you have completed Task# 08 correctly. See Student Evaluation Checklist in this guide.
9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
A. 1. Does water flow in drain easily?		
2. Is the sink in a clean condition?		
3. Is the floor area around the sink clean and dry?		
B. 1. Is the drain completely clear of grease and dirt, permitting the water to move down easily?		
2. Are the sink and plumbing in good condition with no damage?		
3. Is the floor area around the sewer drain clean and dry?		
4. Did you wear the proper hand and eye protection?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-4
TOTAL POINTS POSSIBLE = A-3 B-4

TASK# 08

INFORMATION SHEET 08-1

STUDY WORDS:

caustic	- a chemical that can burn, eat away or destroy by chemical action
a stoppage	- a block or obstacle
a clogged drain	- a drain that is blocked
a vacuum	- a closed area with nothing in it
solution	- a mixture of liquid form
acids and alkalines	- two kinds of chemicals used for cleaning clogged drains

VERBS:

To dissolve	- to become part of a liquid
To react	- to have a chemical action take place between two or more elements

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Clear sewer using hand and power sewer auger

TASK NO: 09

STUDENT WILL: A. Clear sewer using a hand operated sewer auger
B. Clear sewer using a power sewer auger

GIVEN: A. Given a blocked fixture drain, tools and equipment.
B. Given a blocked sewer line, tools and equipment.

TOOLS & EQUIPMENT: hand auger (snake) and power auger

TASK STEPS:

A. 1. Remove sewer entry drain or plug.
2. Insert auger until block age is reached. Push and rotate auger.
3. Use a push and pull action until stoppage is cleared.

B. 1. Remove sewer entry drain or plug.
2. Insert end of auger until blockage is reached.
3. Bump end of auger hard against blockage.
4. Start power auger.
5. Insert pilot and extend to blockage.
6. Bring pilot back to starting position.
7. Test sewer line.
CAUTION: One hand should always be on shut-off switch in case auger jams.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 09-1.

2. See pictures of tools and equipment for Task# 09. See your textbook pgs. 217 and 218.

3. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 09. See teacher.

5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS". (part "A" only).

6. Now read all information listed in part "B" of Task# 09 correctly. See Competency Sheet in this guide.

7. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

8. Fill-out checklist to see if you have completed Task# 09 correctly. See Student Evaluation Checklist in this guide.

9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Was sewer cleared with hand auger?		
2. Was the floor cleaned and dried?		
3. Was the sewer auger cleaned and recoiled?		
4. Was the sewer entry drain or plug replaced?		
5. Does the water flow well in the drain?		
6. Does the water flow with no leaks in the pipe?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-5 B-5
TOTAL POINTS POSSIBLE = A-5 B-5

TASK# 09

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
A. 1. Was sewer cleared with hand auger?		
2. Was the floor cleaned and dried?		
3. Was the sewer auger cleaned and recoiled?		
4. Was the sewer entry drain or plug replaced?		
5. Does the water flow well in the drain?		
6. Does the water flow with no leaks in the pipe?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-5 B-5
TOTAL POINTS POSSIBLE = A-5 B-5

TASK# 09

INFORMATION SHEET 09-1

STUDY WORDS:

entry	- the location where you go into an opening
sewage	- the dirt, grease and other material carried away in a drain
sewer	- a pipe or drain usually under the ground used to carry away water, dirt, etc.
blockage	- a block inside of pipe or drain

VERBS:

To clear	- to remove an obstacle or block
To insert	- to put into something
To bump	- to hit something
To recoil	- to roll back
To jam	- to be caught or stuck

EXPRESSION:

rod it out	- to clear a pipe using a rod (auger)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Cut and join cast iron pipe using caulking

TASK NO: 10

STUDENT WILL: Cut and join cast iron pipe using caulking

GIVEN: A straight end and bell end cast iron pipe, supplies and equipment.

TOOLS & EQUIPMENT: hammer, cutting chisel, hacksaw, rule or tape measure, soap stone marker, tamping chisel, ladle, and lead melting pot

TASK STEPS:

1. Measure and mark joint of pipe to be cut.
   CAUTION: Wear hand and eye protection.
2. Place chisel on cut-off mark. Strike chisel with hammer lightly going around mark.
3. Continue striking chisel harder and rotate pipe until cut is complete.
4. Also cut pipe by sawing with a hacksaw instead of a chisel.
5. Place cut end of pipe in a bell conncetion.
6. Pack oakum into joint, leaving one inch space for lead. Attach joint runner on both a vertical and horizontal joint.
7. Attach joint runner on both a vertical and horizontal joint.
8. Permit lead to harden.
9. Tamp the lead on both the bell and pipe side of the pipe.
   CAUTION: All joints must be dry.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual
Do-it-Yourself Plumbing

LEARNING ACTIVITIES

1. See pictures of tools and equipment you will use for Task# 10. See your textbook pgs. 227 and 228, also Information Sheet 10-1.
2. Read new words that will be presented in this task. See Information Sheet pg. 10-2.
3. Read all information listed on Competency Sheet. See Competency Sheet in this guide.
4. Ask teacher to demonstrate Task# 10.
5. Repeat what the teacher did. See Competency Sheet. Follow instructions in "TASK STEPS".
6. Fill-out checklist to see if you have completed Task# 10 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is pipe clean, straight, and even?		
2. Is pipe centered in bell?		
3. Are joined pipes straight?		
4. Is the lead tamped to both the pipe and bell?		
5. Is the lead nearly flush to the top?		
6. Is the lead joint approximately one inch deep?		
7. Was pipe checked for leaks?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 10

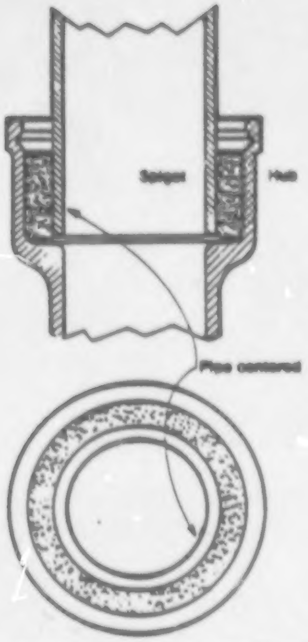
INFORMATION SHEET 10-1

STUDY WORDS:

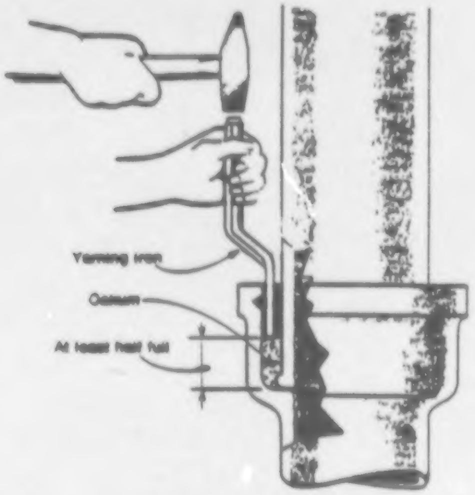
ladle	- a spoon with a deep bowl
to tamp	- to pack down
vertical	- in an up and down direction
horizontal	- in a left to right direction
oakum	- a type of sticky rope made of tar and used in caulking
caulking	- filling joints of pipe with oakum and hammering cooled molten lead into joints
nearly flush	- almost even of level
approximately	- about, around, in the area of
molten lead	- a metal called "lead" that is melted
harden	- to make solid or hard

INFORMATION SHEET 10-2

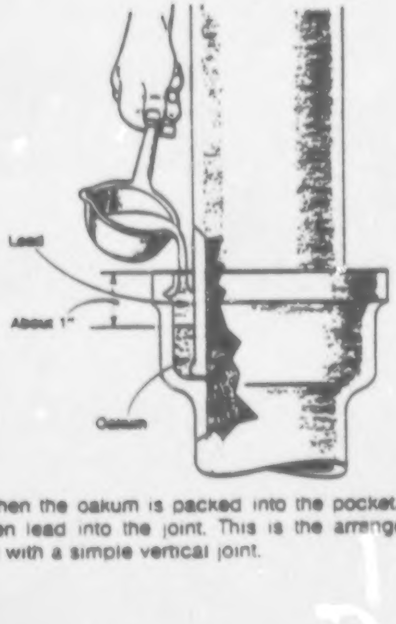
Making a Lead-Caulked Joint


Spigot
Hub
Pipe centered

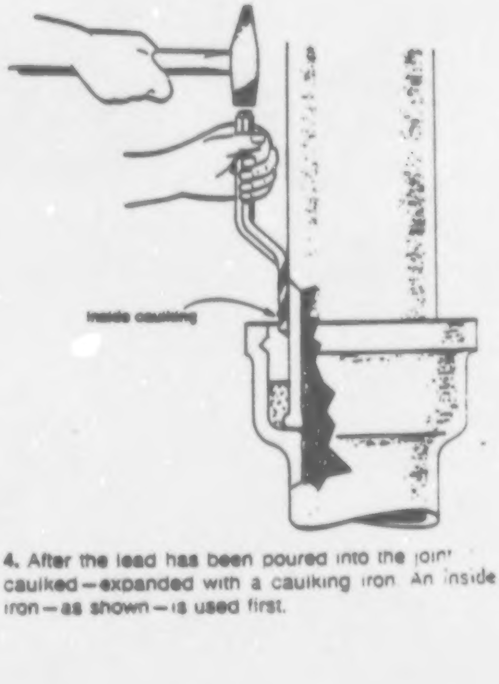
1. Center the spigot of one cast-iron pipe inside the hub of the other.


Yarning iron
Oakum
At least half full

2. Use a yarning iron to pack oakum into the pocket between the spigot and the hub.


Lead
About 1"
Oakum

3. When the oakum is packed into the pocket, pour molten lead into the joint. This is the arrangement used with a simple vertical joint.


Inside caulking

4. After the lead has been poured into the joint caulked—expanded with a caulking iron. An inside iron—as shown—is used first.

Resource# 1
Do-it-Yourself Plumbing Max Alth
Times Mirror Mag., 1st Ed., 1975 pg. 72

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Install a collar clamp

TASK NO: 11

STUDENT WILL: Install a collar clamp

GIVEN: A collar clamp, tools, and supplies

TOOLS & EQUIPMENT: regular screwdriver, steel brush, or sandpaper

TASK STEPS:

1. Clean both pieces of pipe on ends that will be pushed together.
2. Slide a collar clamp onto end of pipe that does not move.
3. Slide neoprene sleeve onto end of same pipe.
   NOTE: About half the total length of sleeve.
4. Slide another collar clamp onto end of other pipe.
5. Push end of second pipe into neoprene sleeve until it is tight against end of first piece of pipe.
6. Slide collar clamps onto neoprene sleeve about 1/4 distance from each end of sleeve and tighten well.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures that show how to put a collar clamp on a pipe joint. See your textbook pg. 228.
2. Read all information listed for Task# 11. See Competency Sheet in this guide.
3. Ask teacher to demonstrate Task# 11 correctly. See teacher.
4. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed TASK# 11 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are collar clamps centered on joint?		
2. Are clamps tight?		
3. Are collar clamps dry with no leaks?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK# 11

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Cut and join plastic pipe (PVC)

TASK NO: 12

STUDENT WILL: Join a straight pipe to an elbow

GIVEN: PVC pipe, fittings, supplies and equipment

TOOLS & EQUIPMENT: miter box, hackshaw, file, solvent #1, sandpaper, solvent #2 reamer and knife

TASK STEPS:

1. Cut the pipe straight. Use miter box.
2. Remove burrs from inside of the pipe with a reamer or a knife.
3. Lightly sand the cut end of the pipe.
4. Add a light cover of solvent #1 to outside end of pipe and inside end of fittings.
5. Wait five to fifteen seconds.
6. Lightly cover with solvent #2 the inside of fitting. Put a heavier coat of solvent #2 on the outside of pipe.
7. Immediately push the pipe into the fitting as far as it will go. You will feel it hit the inside shoulder to the fitting.
8. Turn pipe to get the proper angle.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Testbook - Complete Do-It-Yourself Manual

LEARNING ACTIVITIES

1. See picture of the process, tools, and equipment for Task# 12. See your textbook pg. 232.
2. Read all the information about Task# 12. See Competency Sheet in this guide.
3. Ask teacher to demonstrate Task# 12. See teacher.
4. Repeat what the teacher did. See Competency Sheet. Follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed Task# 12 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checkiist to teacher to check.

STUDENT EVALUAITON CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is the pipe of correct length?		
2. Are the pipe and fitting angles correct?		
3. Is the pipe pushed into the fitting as far as it will go?		
4. Does a thin line of solvent# 2 form a circle around the outside of the joint?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 12

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Install a shower head, faucet, and shut-off valve

TASK NO: 13

STUDENT WILL: Install a shower head, faucet, and shut-off valve on roughed-in water lines

GIVEN: A shower head, faucet, and shut-off valve, tools, and supplies.

TOOLS & EQUIPMENT: pipe wrench, pipe joint compound, teflon tape, crescant wrench, channel lock wrench, and screwdriver

TASK STEPS:

1. Place small amount of pipe joint compound on pipe threads.
2. Slide plate (shield) onto shower pipe.
3. Attach shower pipe end to roughed-in wall pipe end.
4. Press shield against wall. Make sure shield covers hole and wall pipe end.
5. Attach shower head to shower pipe.
6. Place shield over water control valves and press against wall. Attach water control valves.
7. Attach control valve handles with screwdriver.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures and description of Task# 13. See textbook pgs. 234 and 240.

2. Read all information listed on Competency Sheet. See Competency Sheet in this guide.

3. Ask teacher to demonstrate Task# 13. See teacher.

4. Repeat what the teacher did. See Competecny Sheet. Follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 13 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Does shower operate correctly?		
2. Is there a good balance of hot and cold water coming out?		
3. Do the hot and cold water come out of the correct hot and cold controls?		
4. Are you sure there are no leaks?		
5. Are you sure there are no nicks or other marks on the chrome surfaces?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 13

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Install a lavatory-water and drain

TASK NO: 14

STUDENT WILL: Install a lavatory-water and drain

GIVEN: Roughed-in plumbing for connection of lavatory, already cut holes for sink and faucet, tools, supplies and necessary assistance.

TOOLS & EQUIPMENT: level, pipe wrenches, crescent wrenches, tube cutter, chisel, mallet, adjustable locknut wernch and hex wrench , channel locks, screwdriver, adhesive tape.

TASK STEPS:

1. Mount sink brackets.
2. Put a coat of sealant on lavatory.
3. Fit lavatory into brackets.
   NOTE: If lavatory is going to rest on cabinet, be sure to seal around edges.
4. Attach lavatory to rim.
5. Put a coat of plumber's putty on flange of pull-out plug and set plug in lavatory.
6. Put a coat of plumber's putty on faucet
7. Connect water supply line.
8. Connect drain line to lavatory.
   A. Put rubber washer over drain hole and put drain flange on.
   B. Place new washer on locknut and tighten drain flange.
   C. Push slip nut onto tail piece to lavatory.
   D. Push seal gasket onto tail piece.
   E. Push P-trap fitting onto tail piece.
   F. Slide gasket down tight and straight against P-trap fitting.
   G. Slide slip nut down and tighten with hand.
   H. Wrap chrome fittings with adhesive tape.
   I. Tighten nut firmly with pipe wrench.
   J. Repeat step "A" to "I" for opposite end of fitting.
9. Check for leaks.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of process and equipment you will use to do Task# 14. See textbook pgs. 212-213 and 238-239.
2. Read new words that will be presented in this task. See Information Sheet 14-1 in this guide.
3. Read all information listed for Task# 14.
4. Ask teacher to demonstrate this task.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
6. Fill-out Checklist to see if you have completed Task# 14 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is the gasket on straight?		
2. Is the slip nut on tight with no cross cut threads?		
3. Are you sure there are no leaks?		
4. Are chrome fittings in good condition with no scratches or marks on it?		
5. Is the surface of the sink in good condition with no scratches or marks on it?		
6. Is the sink placed firmly in a level position?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 14

INFORMATION SHEET 14-1

STUDY WORDS:

lavatory or wash basin	- sink for washing hands
mallet	- a type of hammer used to hit a chisel (see picture in textbook pg. 14.
hex wrench	- also called an allen wrench (See picture in textbook pg.23)
plumber's putty	- a soft plastic mixture that is a type of cement
sealant	- a substance used to seal pipe joints, so water cannot leak out of joints
brackets	- metal piece put under a sink to help carry the weight of the sink
scratches	- marks on a surface cut with something sharp or pointed

VERBS:

To wrap	- to wind in a circle
To mount	- to put up against something and make tight and secure
To fit	- to insert, to put into

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Repair a leak in a water line

TASK NO: 15

STUDENT WILL:
A. Repair a break in a water pipe using a repair clamp
B. Make an emergency patch for a leak in a water pipe.
C. Apply sealing cement to a leaking pipe joint.

GIVEN: Water pipe lines, tools and supplies.

TOOLS & EQUIPMENT: regular screwdriver, coarse sandpaper, an emergency clamp and cover the size of ruptured pipe, rubber, pipe sealing cement

TASK STEPS:

A. 1. Turn water off.
2. Clean pipe to bare metal around leak.
3. Center cover over break on pipe.
4. Put metal clamp over cover around pipe.
5. Put screws or bolts through clamp and tighten well.
6. Turn on water pressure and examine repair clamp for leaks.
7. Make necessary adjustments.

B. 1. Turn water off.
2. Tighten a patch of metal and rubber over leak in pipe.
3. Place clamps directly over leak in pipe.
4. Tighten all clamps.
5. Turn on water pressure to check for leaks.

C.1. Turn water off.
2. Dry the pipe joints.
3. Tighten the pipe threads.
4. Apply sealing cement all around pipe joint.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of process and equipment you will need to do Task# 15. See textbook pgs. 212 and 225.

2. Read new words that will be presented in this task. See Information Sheet pg. 15-1.

3. This Task is in three parts. The parts are marked "A", "B" and "C". Read all information listed in part "A" only. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 15. See teacher.

5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS", (part "A" only).

6. Now read all information listed in part "B" of Task# 15. See Competency Sheet in this guide.

7. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

8. Read all informtion listed in part "C" of Task# 15 as you did for parts "A" and "B". See Competency Sheet in this guide.

9. Repeat step numbers 4 and 5 of this task.

10. Fill-out Checklist to see if you have completed Task# 15 correctly. See Student Evaluation Checklist in this guide.

11. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
A. 1. Is metal clamp the right size?		
2. Is clamp on tightly?		
3. Are you sure there are no leaks when water is turned on?		
B. 1. Are the clamps directly over the leak?		
2. Are the clamps on tightly?		
3. Are you sure there are no leaks when the water is turned on?		
C. 1. Is the pipe joint dry with no leaks?		
2. Does the sealing cement completely cover the pipe joint?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-3 C-2
TOTAL POINTS POSSIBLE = A-3 B-3 C-2

TASK# 15

INFORMATION SHEET 15-1

STUDY WORDS:

bare metal	- metal in its natural condition with no paint or other covering on it
fine sandpape	- sandpaper that has very small pieces of sand attached to it
coarse sandpaper	- sandpaper that has large pieces of sand attached to it
particle or speck	- a very, very small piece of anything
a patch	- a piece of material put on to cover a hole or break in a pipe
adjustments	- the changing of the position of something to make fit

VERBS:

To apply	- to put onto something
To center	- to place on the middle part of something
To burst or to rupture	- to break open because of pressure from inside

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Install a tap-on fitting on a water line

TASK NO: 16

STUDENT WILL: Install a tap-on fitting on a water line

GIVEN: A water line to tap, tools and equipment.

TOOLS & EQUIPMENT: pipe wrenches, crescent wrenches, screw driver, hand drill and bits, mastic, and saddle T clamp.

TASK STEPS:

1. Find the area where you will place the saddle T clamps.
2. Shut-off water and drain lines.
3. Place mastic (glue) on pipe.
4. Wrap rubber pad around pipe.
5. Tighten clamp into place on the pipe.
6. Take off screw valve and drill into valve hold. Go through the wall of the pipe.
7. Connect tapped pipe line into main line.
8. Check for leaks.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read information about process and equipment you will use for this task. See your textbook pg.238.

2. Read all information listed in Task# 16. See Competency Sheet in this guide.

3. Ask teacher to demonstrate Task#16. See teacher.

4. Repeat what the teacher did. See Competency Sheet in this guide. Follow instruction in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 16 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	RATING NO
1. Does the clamp fit the natural curve of the water pipe?		
2. Are you sure there are no leaks?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 2
TOTAL POINTS POSSIBLE = 2

TASK# 16

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Patch a leak in a cast iron pipe

TASK NO: 17

STUDNET WILL: A. Patch a leak in a cast iron pipe by brazing
B. Repair a leak in a cast iron pipe with a epoxy cement

GIVEN: Cast iron pipe, tools, supplies and necessary assistance.

TOOLS & EQUIPMENT: steel brush, acetylene brazing torch, flux coated brazing rods, chisel, hammer, and file.

TASK STEPS:

A. 1. Shut off water supply to system.
   2. Clean out cracked area of pipe.
   3. Heat cracked area of pipe with brazing torch until pipe is red.
      CAUTION: Sewer gas is explosive. It may be necessary to clear the pipe line of any sewer gas that has collected there. Wear hand and eye protection.
   4. While cracked area of pipe is red hot, slowly melt brazing rod into crack.
      CAUTION: Be sure that the melted metal does not drip into water or wet dirt. This could cause an explosion.
   5. Turn water on and check for leaks.
      NOTE: Let pipe cool before turning on water. Cold water inside a hot cast iron pipe can cause pipe to break.

B. 1. Clean the pipe area to be repaired.
   2. Use a torch to dry the pipe.
   3. Clear out crack or leaking area with a chisel.
   4. Apply epoxy cement.
   5. Let cement dry.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Look at pictures of process and equipment you will use to do Task# 17. See your textbook pg. 225.

2. Read new words that will be presented in this task. See Information Sheet 17-1 in this guide.

3. This task is in two parts. The parts are marked "A" and "B". Read all the information listed in part "A" only. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 17. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions listed in "TASK STEPS". (part "A" only).

6. Now read all the information listed in part "B" of Task# 17. See Competency Sheet in this guide.

7. Repeat step numbers 4 and 5 of this paper of part "B".

8. Fill-out checklist to see if you have completed Task# 17 correctly. See Student Evaluation Checklist in this guide.

9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Is the patched area dry with no leaks?		
2. Does enough brazing metal cover the patched area?		
B. 1. Is the patched area dry with no leaks around it?		
2. Does enough epoxy cement cover the patched area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-2 B-2
TOTAL POINTS POSSIBLE = A-2 B-2

TASK# 17

INFORMATION SHEET 17-1

STUDY WORDS:

brazing	- a type of soldering
crack	- a break in a pipe in the form of a thin line
explosive	- a gas that can burst inside a pipe. It makes a loud noise and causes pieces of pipe to fly into the air
explosion	- the noise and damage make an explosion
danger	- something that can hurt you
thoroughly	- completely

EXPRESSION:

To blow up	- to burst causing an explosion

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Remove standing water using sump pump

TASK NO: 18

STUDENT WILL: Remove standing water using a sump pump

GIVEN: Standing water, tools, equipment and necessary assistance.

TOOLS & EQUIPMENT: Sump pump, shovel, extension cord, rubber boots, rubber gloves, a three pronged grounding plug

TASK STEPS:

1. Shovel out enough dirt to put the sump pump in the lowest possible location.

2. Put the pump in place.

3. Attach a grounding plug into plug on end of pump if one is not there.
   CAUTION: Be sure all electrical equipment has a grounding plug attached to it. Do not touch the sump pump after you have turned the power on.

4. Place the discharge hose so that water will run out and not back up into hose.

5. Cut grooves and ditches to drain areas where water pockets are

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of equipment you will use to do Task# 18. See your textbook pg. 244.

2. Read new words that will be presented in this task. See Information Sheet 18-2 in this guide.

3. Read all information listed in Task# 18. See Competency Sheet in this guide.

4. Ask teacher to demonstrate Task# 18. See teacher.

5. Repeat what the teacher did. See Competency Sheet. Follow instructions in "TASK STEPS".

6. Fill-out checklist to see if you have completed Task# 18 correctly. See Student Evaluation Checklist in this guide.

7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was all standing water removed?		
2. Were all safety precautions followed?		
3. Was all equipment cleaned and put away?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK# 18

INFORMATION SHEET 18-1

STUDY WORDS:

hose	- a soft rubber tube used to carry water from one location to another location
discharge hose	- a tube that drains water out and away from a location
suction hose	- a tube that takes up standing water
narrow	- not wide
groove	- a long narrow cut made into the dirt
ditch	- a long narrow canal that is cut in the dirt
precaution	- caution or care used in advance

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Repair or replace a flush valve

TASK NO: 19

STUDENT WILL: Repair or replace a flush valve

GIVEN: A flush valve to repair or replace, tools and equipment.

TOOLS & EQUIPMENT: screwdriver, gaskets, vice grip, channel lock pliers, adjustable wrench, new flush valve repair kit

TASK STEPS:

1. Cut water off.
2. Remove lid from tank.
3. Drain all water.
4. Remove nut from underside of tank and remove flush valve.
5. Repair or replace flush valve.
6. Replace lid for tank.
7. Turn water on.
8. Test flush valve.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of equipment you will use to do Task# 19. See your textbook pg. 223.

2. Read all information listed for Task# 19. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 19 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are you sure there are no leaks?		
2. Does flush valve shut off completely?		
3. Is the water height in toilet tank and bowl correct?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSBILE = 3

TASK# 19

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Shorten bolt and machine screw

TASK NO: 20

STUDENT WILL: Shorten bolt and machine screw

GIVEN: A bolt that is too long for a particular bolt hole or projects too for beyond the nut.

TOOLS & EQUIPMENT: hacksaw, file, open end wrench screwdriver and a multipurpose tool.

TASK STEPS:

1. Measure the depth of bolt hole or of bolt length when the nut is tightened.
2. Mark bolt for the correct length needed.
3. Thread a nut onto the bolt beyond the cut mark.
4. Cut bolt with a hacksaw.
5. File a bevel edge around the cut edge of the bolt.
6. Unthread the nut off the bolt.
7. Thread the bolt to the length marked using a multpurpose tool.
8. Press multipurposed tool handle to cut bolt.
9. Unthread bolt from multipurpose tool.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See pictures of tools and equipment you will use to do Task# 20. See your textbook pgs. 258, 425, and 428.
2. Read new words that will be presented in this task. See Information Sheet 20-1 in this guide.
3. Read all information listed for Task# 20. See Competency Sheet in this guide.
4. Ask teacher to demonstrate Task# 20. See Teacher.
5. Repeat what the teacher did. See Competency Sheet in this guide. Follow instructions in "TASK STEPS".
6. Fill-out checklist to see if you hace completed Task# 20 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are the threads in good condition with no damage?		
2. Does the nut go on to the bolt easily?		
3. Was the bolt cut the correct length?		
4. Are the cut edges of the bolt smooth?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 20

INFORMATION SHEET 20-1

STUDY WORDS:

bevel edge - the rim or edge of the cut surface of a bolt that is filed down at an angle

beyond - farther than or a greater distance than something else

sharp edges - the sides of the cut surface of a bolt that are pointed and not rounded

VERBS:

To project - to be out in front of something

To remain on - to leave on

To file - to smooth down with a file

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Cut ceramic and quarry tile

TASK NO: 21

STUDENT WILL: Cut to fit straight and irregular surfaces of tile

GIVEN: Pieces of ceramic and quarry tiles, tools and equipment.

TOOLS & EQUIPMENT: hacksaw with carbide blades, tile cutter, file, tile cutting nippers, tile pliers, emery stone, and long thick nail

TASK STEPS:

1. Mark edges of tile to be cut.
2. Using tile cutter score along straight marks (see textbook pg. 354).
3. Break off scored part of tile by pressing tile over nail.
4. Put carbide blade in hacksaw and cut irregular edges.
5. Cut off any uneven edges that are still there with cutting nippers.
6. Make the cut edges smooth with a file or emery stone.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of process, tools, and equipment for this task. See your textbook pgs. 354 and 356.

2. Read all information listed for Task# 21. See Competency Sheet in this guide.

3. Ask teacher to demonstrate Task# 21. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 21 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was the finished cut made along the marked edge of the tile?		
2. Is the tile in good condition and not broken?		
3. Is the surface of the tile in good condition with no scratches?		
4. Were all uneven edges cut off?		
5. Are all cut edges smooth?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 21

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Test for gas leak in pipes using soap solution

TASK NO: 22

STUDENT WILL: Test for gas leak in pipes

GIVEN: A possible gas leak in pipe, tools and equipment.

TOOLS & EQUIPMENT: pre-mixed leak detector solution, cup, soap, brush, chalk, and flash light.

TASK STEPS:

1. Find gas meter and follow the entry gas pipe lines to all lines and shut-off valves that you can see.

2. Open windows or doors in any closed area.

3. Turn off all electrical appliances.

4. Mix soap solution or use pre-mixed leak detector solution.
   CAUTION: Never use a match or open flame to check for gas leaks.

5. Begin brushing solution on pipe fitting that is farthest away from meter. Fitting joint must be soaped all the way around.

6. Working back towards the meter, brush solution on each fitting joint. Mark each leaking joint with chalk.

EVALUATION: Student Evaluation Checklist. Must score satosfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed for this task. See Competency Sheet in this guide.

2. Ask teacher to demonstrate Task# 22. See teacher.

3. Repeat what the teacher did. See Competency Sheet in this guide and follow instructions in "TASK STEPS".

4. Fill-out checklist to see if you have completed Task# 22 correctly. See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Were all the shut-off valves found?		
2. Were all electrical appliances turned off?		
3. Were windows or doors opened in all closed area?		
4. Were gas leaks found?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 22

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Thaw frozen pipes

TASK NO: 23

STUDENT WILL: Thaw frozen water line until water flows easily

GIVEN: A frozen pipe, tools and supplies

TOOLS & EQUIPMENT: heat lamp, electrical heating cable, pipe insulation, propane torch, extension cord, and light bulb, aluminum foil, towels or rags, hot water, and portable heaters

TASK STEPS:

1. Open all valves and faucets.
2. Disconnectd pipe connections at end of frozen water line.
3. Use portable heaters to heat area of frozen pipe line.
4. Start heating from open faucets or pipe connections towards the frozen area.
5. When using a propane torch, protect exposed wood or combustibles by covering them with sheet metal, asbestos board, etc.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at picture of process and equipment you will use to do Task# 23. See textbook pg. 225. Also see Information Sheet 23-1.

2. Read new words that will be presented in this task. See Information Sheet pg. 23-2 in this guide.

3. Read all information listed for Task# 23.

4. Ask teacher to demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Fill-out Checklist to see if you hace completed Task# 23 correctly. See Student Evaluation Checklist in this guide.

7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

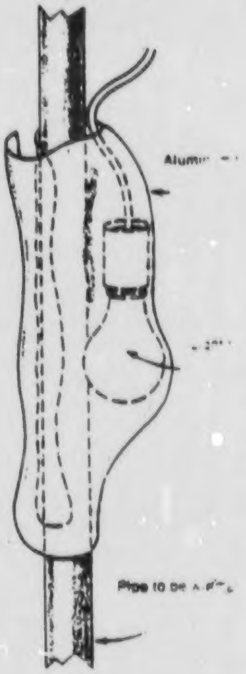
ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were all valves and faucets opened?		
2. Were all combustibles protected by sheet metal or similar protection?		
3. Were frozen pipes thawed?		
4. Was water collected and cleaned-up?		
5. Were frozen pipes protected from further freezing?		
6. Were all work areas cleaned up?		

TASK# 23

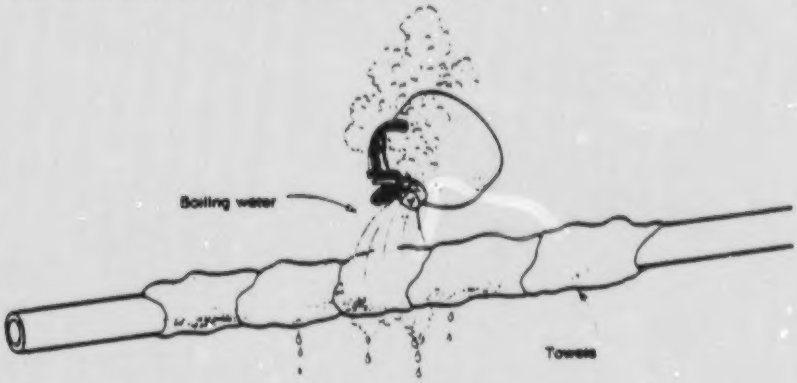
INFORMATION SHEET 23-1

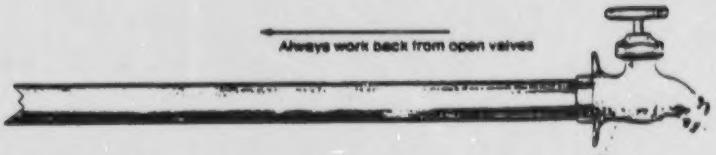
Thawing Pipes

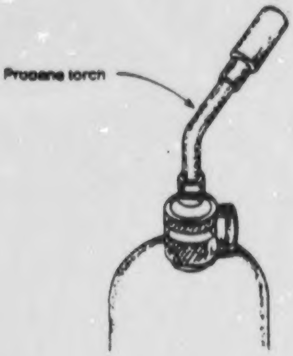
Place a light bulb against the pipe to be kept warm and wrap some aluminum foil around the bulb and pipe.


Alum
Pipe to be

Wrap towels around the pipe and soak with hot water.


Boiling water
Towels


Always work back from open valves


Propane torch

When thawing a pipe, always start at the valve or faucet end. This eliminates the possibility of trapping steam inside the pipe and causing an explosion.

Resource# 1

Do-it-Yourself Plumbing - Max Alth
Times Mirror Mag., 1st Ed., 1975, pg.282

INFORMATION SHEET 23-2

STUDY WORDS:

fire proof - something that will not burn

asbestos - a fire proof material

combustible - anything that burns easily

further - more or continued

exposed - anything that has no cover or protection

VERBS:

To thaw - defrost or melt

To burn - to be on fire

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Plumbing Related Duties

JOB TASK: Locate wall studs and plumbing in a wall

TASK NO: 24

STUDENT WILL: A. Locate wall studs
B. Locate pipes in a wall

GIVEN: A wall to locate wall studs and pipes, tools, and equipment.

TOOLS & EQUIPMENT: rule or tape measure, clam hammer, awl or long nail magnet, magnetic stud finder, chalk and building blueprint

TASK STEPS:

A. 1. Inspect floor and ceiling areas close to wall for nails.
2. Make a sounding test by lightly tapping on wall and listening for a solid sound.
3. Measure 16 inches in from corner.
4. Hammer a nail or awl into the wall, moving it about 1 1/2 inches in each direction until stud is located.

B. 1. Inspect beneath floor for pipes.
2. Inspect attic for pipes.
3. Hammer a blunt awl or nail into wall at approximate location until you find a pipe.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of process and equipment you will use to do Task# 24. See textbook pgs. 76, 235, and 265.

2. Read new words that will be presented in this task. See Information Sheet pg.. 24-1 in this guide.

3. This task is in two parts. The parts are marked "A" and "B". Read 11 information listed in part "A" only. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 24. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Now read all information listed in part "B" of Task# 24. See Competency Sheet.

7. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

8. Fill-out checklist to see if you have completed Task# 24 correctly. See Student Evaluation Checklist in this guide.

9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
A. 1. Was wall stud found?		
2. Was wall left in good condition with no damage?		
B. 1. Was wall pipe located?		
2. Was all left in good condition with no damage?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-2 B-2
TOTAL POINTS POSSIBLE = A-2 B-2

TASK# 24

INFORMATION SHEET 24-1

STUDY WORDS:

attic	- a room or space immediately under the roof
sound	- a noise
beneath	- under
blunt	- not pointed or sharp
blueprint	- a line drawing that has an exact plan of a building's construction

VERBS:

To inspect	- to look at carefully
To tap	- to knock on or hit lightly
To locate	- to find

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean a grease trap

TASK NO: 100

STUDENT WILL: Clean a grease trap

GIVEN: A clogged grease trap, tools, and necessary assistance.

TOOLS & EQUIPMENT: screwdriver, socket or adjustable wrench, putty knife, vacuum, and anti-bacterial drain mixture

TASK STEPS:

1. Locate grease trap.
   CAUTION: Grease traps are sometimes in places that are difficult to reach. Be careful to protect eyes and other parts of body from caustic solutions or sharp objects in the grease trap.
2. Take off the grease trap cover.
3. Take out grease, soap and all other material from the grease trap. Use the wet vacuum.
4. Check to make sure that water lines coming into and going out of the building do not have dirt or other material in them.
5. Remove all dirt from sides of trap with putty knife.
6. Put the anti-bacterial drain mixture in trap.
7. Replace the cover on grease trap and clean area around it.
8. Remove grease and dirt taken from trap and throw away in a proper location.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at picture of grease trap. See your textbook pg. 248.
2. Read all information listed for Task# 100. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
5. Fill-out the checklist to see if you have completed Task# 100 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUAITON CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is the grease trap clean?		
2. Does the water flow easily?		
3. Was the grease trap cover put back on?		
4. Was the area around the grease trap cleaned?		
5. Were grease and dirt removed from trap thrown away in a proper location?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 100

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Damp and wet mop floor

TASK NO: 101

STUDENT WILL: A. Damp mop a lightly soiled floor
B. Wet mop a moderately soiled floor

GIVEN: Floor to clean, supplies and equipment.

TOOLS & EQUIPMENT: clean mop, bucket with mop wringer, hot water, cleaner, spray spot cleaner, putty knife and wet floor signs

TASK STEPS:

A. 1. Gather the tools and equipment you will use.
   2. Place wet floor signs on floor at both ends of work area.
   3. Mix cleaning solution as indicated on label.
   4. Wet the mop in solution and squeeze mop as dry as possible.
   5. Place mop parallel to wall and push mop along length of wall, Use hands to get mop into corners.
   6. Rinse mop and wring out. Only clean water should be used.
   7. Use a side-to-side movement to mop the rest of floor.
   8. Remove gum and other materials from floor with putty knife.

B. 1. Do the same steps that you did in part "A" of this task, but use more cleaner in the mop solution.
   2. After wet mopping floor, repeat with damp mopping operation. Make sure you remove all standing water.
   3. Clean equipment and return it to proper place.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Custodial Training

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 101-1 in this guide.

2. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this part of Task# 101. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Now read all information about part "B" of this task. See Competency Sheet.

6. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

7. Fill-out checklist to see if you have completed Task# 101 correctly. See Student Evaluation Checklist in this guide.

8. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
(Use this checklist for both "A" and "B")		
1. Were the wet floor signs placed at both ends of work area?		
2. Was all floors mopped?		
3. Was only clean water used?		
4. Was mop wrung out frequently?		
5. Were all gum and other material removed from floor?		
6. Is floor dry with no standing water?		
7. Is floor clean with no mop streaks?		
8. Was all equipment cleaned and returned to a proper place?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 101

INFORMATION SHEET

STUDY WORDS:

a damp mop	- a mop put in liquid then taken out and squeezed as dry as possible
mop streaks	- lines or long thin marks left on floor by mop
moderately	- average, medium amount
parallel to wall	- to reach out in the same direction as wall moving along length of wall
soiled	- dirty, not clean

VERBS:

To gather	- to put together in one place
To rinse	- to remove soap and dirt by washing lightly
To wring/wrung	- to turn and squeeze

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Scrub floor by using a buffer

JOB NO: 102

STUDENT WILL: Scrub floor using a buffer

GIVEN: A soiled floor, supplies and equipment.

TOOLS & EQUIPMENT: buffer type scrubber, putty knife hot water, cleaning solution, brush, spray spots cleaner, and wet floor signs

TASK STEPS:

1. Gather tools and equipment.
2. Place wet floor signs at both ends of work area.
3. Remove gum and other material from floor with putty knife.
4. Scrub with hand brush the corners and along molding areas.
5. Lay down cleaning solution and wait five minutes.
6. Scrub floor by moving buffer back and forth with pad or brush of buffer resting flat on floor. Do a small area at one time.
7. Pick up excess solution with vacuum connection on buffer.
8. Mop area well with clean hot water. Make sure you remove any standing water.
9. Clean and return equipment to storage area.

EVALUATION: Student Evalution Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 102-1 in this guide.

2. Read all information listed for Task# 102. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Comptency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 102 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were the wet floor signs placed at both ends of work area?		
2. Was all floors scrubbed?		
3. Were corners and molding areas cleaned?		
4. Were all gum and other material removed from floor?		
5. Was floor mopped with clean, hot water?		
6. Is floor dry with no standing water?		
7. Was all equipment cleaned and put in the proper storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 102

INFORMATION SHEET 102-1

STUDY WORDS:

molding	- a long, thin piece of wood or plastic used along the bottom of a wall to decorate and protect wall. (See picture in textbook pg. 102.)
buffer	- a piece of equipment used to clean or polish a floor. (See picture in textbook pg. 115.)
storage area	- a closet or room where one keeps equipment

VERBS:

To scrub/scrubbed	- to clean by brushing or by moving equipment over a surface using pressure

EXPRESSIONS:

back and forth	- to move from the back of an area to the front

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Remove stains (spots) from floor

TASK NO: 103

STUDENT WILL: Remove stains from floor

GIVEN: A floor with unknown stains, equipment, and supplies.

TOOLS & EQUIPMENT: clean mop, bucket with mop wringer, hot water, cleaners, floor wax, spray spot cleaner, putty knife, and wet floor sign

TASK STEPS:

1. Place wet floor signs on floor around work area.
2. Determine the floor type.
3. Read information on cleaners to know which ones are safe for floor type.
4. Try several safe cleaners then continue to use the one that works best until stain is removed.
5. Clean the stained area well with a damp mop.
6. When floor is dry, wax the area that you cleaned.
   NOTE: No rings should show around the area that was stained.
7. Clean and return all equipment to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read about floor types and spot removers. See textbook pgs. 117, 196, 295, and 459.
2. Read all information listed in Task# 103. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed Task# 103 correctly.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were wet floor signs placed around work area?		
2. Were stains removed from floor?		
3. Was cleaner removed from floor?		
4. Is floor in good condition with no damage?		
5. Is floor finished evenly with no rings around stained area?		
6. Was all equipment cleaned and returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 103

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Vacuum carpet

TASK NO: 104

STUDENT WTILL: Vacuum a carpet

GIVEN: A soiled carpet, equipment and supplies.

TOOLS & EQUIPMENT: vacuum cleaner, and extra filter bags

TASK STEPS:

1. Raise or lower the head of vacuum to proper height needed for type of carpeting.

2. Start vacuum and move it across carpet. In very dirty areas (walk ways) move machine back and forth several times. Then, if necessary, vacuum from side to side.

3. Move furniture or vacuum under it when possible. Return moved furniture to original position.

4. In carpeted classrooms vacuum carpet area beside area each row of chairs. As you vacuum an area move the chairs onto the cleaned area and vacuum the area where the chairs were standing. Repeat for each rows of chairs.

5. Return vacuum cleaner to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Owners Guide to Vacuum Cleaners

LEARNING ACTIVITIES

1. Read all information listed in Task# 104. See Competency Sheet in this guide.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
4. Fill-out checklist to see if you have completed Task# 104 correctly. See Student Evaluation Checklist in this guide.
5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RAITING	
	YES	NO
1. Was correct cleaning height set for type of carpet being vacuumed?		
2. Was any moved furninture returned to its orignal position?		
3. Does all carpeting look clean?		
4. Was vacuum returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 104

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Wet shampoo carpet

TASK NO: 105

STUDENT WILL: Wet shampoo a carpet

GIVEN: A carpet to be cleaned, equipment and supplies.

TOOLS & EQUIPMENT: wet/dry vacuum, carpet shampoo machine, cleaning solution, and how water

TASK STEPS:

1. Remove furniture from area.
2. Close off area to be cleaned until carpet dries.
3. Dry-vacuum carpeting well.
4. Mix cleaning solution as indicated on label and put in tank of shampoo machine.
5. Move machine to furthest corner of room from entrance.
6. Start machine and open valve to let water flow through brush. Keep machine moving. Set flow so that a little bit of soap suds are present around edges of brush as machine moves over carpet.
7. Move machine along in small circles to make sure you cover carpet evenly and completely.
8. Have second person follow shampoo machine using the wet/dry vacuum to pick up the liquid solution.
9. Clean tools and equipment and return to storage area.
10. Return furniture to original position when carpet is dry.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Owners Operating Manual

LEARNING ACTIVITIES

1. Read all information listed in Task# 105. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions listed in "TASK STEPS".

4. Fill-out checklist to see if you have completed Task# 105 See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHCKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was the carpet cleaned evenly and completely?		
2. Was area to be cleaned closed off until carpet dried?		
3. Was furniture returned to original position when carpet dried?		
4. Was equipment cleaned and returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 105

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean painted surfaces

TASK NO: 106

STUDENT WILL: Clean a soiled, painted surface

GIVEN: A soiled, painted surface, supplies and equipment.

TOOLS & EQUIPMENT: bucket, hot water, detergent, stain cleaners, sponge, clean dry rags, ladder and drop cloth

TASK STEPS:

1. Lay drop cloth down to protect floor area.
2. Wipe or dust off the complete painted area.
3. Examine marks or stains.
4. Remove all marks and stains from surface with recommended cleaner. Take care that the cleaned surface keeps an even color.
5. Wash surface with detergent and water solution start at bottom and work up. (See picture at bottom of Information Sheet 106-1).
6. Immediately rinse each washed area. Make sure there are no streaks on cleaned surfaces.
7. Wipe dry with lint-free dry rag.
8. Return all equipment and supplies to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: The Housekeeping Procedure Manual

LEARNING ACTIVITIES

1. Read all information listed in Task# 106. See Competency Sheet in this guide.

2. Look at pictures and new study words. See Information Sheet 106-1 in this guide.

3. Ask teacher to demonstrate Task# 106. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEP".

5. Fill-out checklist to see if you have completed Task# 106 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are all marks and spots removed?		
2. Is the cleaning even with no streaks on surfaces?		
3. Were the cleaned surfaces dried?		
4. Were all equipment and supplies returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 106

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean restroom

TASK NO: 107

STUDENT WILL: Clean restroom and replace used supplies

GIVEN: A dirty restroom, supplies and equipment

TOOLS & EQUIPMENT: floor buffer, bucket with wringer, hot water, detergents, sponges, mops, clean rags, toilet paper, paper hand towels, soap, toilet cleaner, and glass cleaner

TASK STEPS:

1. Block entrance to washroom put chair or other object in dioorway.
2. Remove and empty garbage cans (waste cans).
3. Remove spots and marks from restroom walls and walls in toilet areas.
4. Wash all parts of toilets.
5. Wash sinks and faucets.
6. Polish faucets with dry clean rag.
7. Replace toilet paper, soap, and paper hand towels.
8. Add disinfectant to toilets.
9. Scrub floor using a buffer.
10. Remove water with a wet/dry vacuum cleaner.
11. Dry mop the floor.
12. Return all equipment to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 107. See Competency Sheet in this guide.
2. Ask teacher to demonstrate Task# 107. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
4. Fill-out checklist to see if you have completed Task# 107 correctly. See Student Evaluation Checklist in this guide.
5. Give completed Student Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was entrance to restroom blocked?		
2. Were toilet paper, soap, and hand towels replaced?		
3. Were toilets and sinks cleaned?		
4. Were faucets cleaned and polished?		
5. Are all wall areas cleaned with no marks, spots, and streaks?		
6. Is floor area clean and dry?		
7. Are all waste cans empty?		
8. Was equipment returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 107

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Strip (remove) wax using scrubbing machine

TASK NO: 108

STUDENT WILL: Strip wax from floor

GIVEN: A floor to be stripped of wax, supplies and equipment.

TOOLS & EQUIPMENT: floor buffer, stripping pads, wet/dry vacuum, mops and wringer, stripper chemicals, hot water, bucket, and wet floor signs

TASK STEPS:

1. Place wet floor signs around work area.
2. Check machine cord for any breaks.
3. Using a scrub pad on machine, run machine around furniture that cannot be moved and around wall moldings.
4. Mix solution as indicated on directions of stripper chemical and place in tank of scrubbing machine.
5. Run machine with solution over an area of floor then wait to let solution work for the time indicated on directions.
6. Start scrubbing action by moving machine slowly from left to right and back again. Make sure you spend enough time scrubbing each area.
7. Clean the scrub water from each area you have scrubbed and check to see if wax is coming up.
8. Vacuum standing water and mop with a clear vinegar and water solution. Make sure all marks and streaks are removed.
9. Clean and return equipment to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 108. See Competency Sheet in this guide.

2. Ask teacher to demonstrate Task# 108. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

4. Fill-out checklist to see if you have completed Task# 108 correctly. See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Were wet floor signs placed around work area?		
2. Was all wax removed from floor?		
3. Are you sure that there are no scrub marks or streaks on floor?		
4. Was all equipment cleaned and put away?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 108

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Apply sealer and wax floor

TASK NO: 109

STUDENT WILL: A. Seal a floor
B. Wax a clean floor

GIVEN: Clean floors, equipment and supplies.

TOOLS & EQUIPMENT: floor sealer, sealer applicator, mop, bucket and wringer, floor wax, and wet floor signs

TASK STEPS:

A.
1. Collect supplies and equipment and put them in area to be sealed.
2. Place wet floor signs around work area.
3. Start in a corner with your back towards the door. Apply sealer to a small area of floor slowly pull applicator towards you then back to wall. Continue moving applicator back and forth until area is covered.
4. Standing on one side of sealed area, cover this area again, moving applicator in the pattern of an "X" across the floor. Be careful that sealer does not "tear" or pull away from floor surface. Continue this pattern until floor area is covered.
5. Repeat process until all floor is covered.
6. Clean and return applicator and sealer to storage area.

B.
1. Place wet floor signs around work area.
2. Put wax solution into clean bucket.
3. Place mop in solution and wring out well.
4. Push the damp mop around edges and corners of room to apply a thin coat of wax.
5. Wet and wring out mop as often as necessary to cover the rest of room with a thin coat of wax.
6. Permit wax to dry for 30 minutes or more.
7. Clean and return supplies to stroage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each part of Checklist.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See information on putting on sealers. See your textbook pgs. 115 and 409.

2. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this part of Task# 109. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS". (part "A" only).

5. Now read all information listed in part "B" of Task# 109. See Competency Sheet.

6. Ask teacher to demonstrate this part of Task# 109. See teacher.

7. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS". (part "B" only).

8. Fill-out checklist to see if you have completed Task# 109 correctly. See Student Evaluation Checklist in this guide.

9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Were wet floor signs placed around work area?		
2. Does floor sealer cover all of floor area?		
3. Does floor finish look clear with no darker or lighter areas?		
4. Was equipment cleaned and returned to storage area?		
B. 1. Were wet floor signs placed around work area?		
2. Does wax cover floor evenly with no streaks?		
3. Does waxed surface look clean?		
4. Were all supplies cleaned and returned storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-4 B-4
TOTAL POINTS POSSIBLE = A-4 B-4

TASK# 109

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Polish floor using a buffing machine

TASK NO: 110

STUDENT WILL: Polish a waxed floor using a buffing machine

GIVEN: A waxed floor that needs polishing and equipment.

TOOLS & EQUIPMENT: buffing machine with buffing pads

TASK STEPS:

1. Install soft buffing pad on buffing machine.
2. Plug in (connect) buffer cord.
3. Check to see if machine is operating correctly.
4. Run buffing machine around edges of room. Start at wall opposite exit. Move machine to the right or left and go all around sides of room.
5. Polish the rest of room by moving machine back and forth across room, starting at wall opposite exit.
6. Clean buffing machine and equipment and return to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 110. See Competency sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

4. Fill-out checklist to see if you have completed Task# 110 correctly. See Student EValuation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Does floor look clear and smooth?		
2. Was buffing done evenly with no streaks or bu;ff marks?		
3. Was equipment cleaned and returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK# 110

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean windows

TASK NO: 111

STUDENT WILL: Clean windows

GIVEN: Dirty windows to clean, tools and supplies.

TOOLS & EQUIPMENT: glass window cleaner, squeegee, brush, clean dry rags, and stepladder (see stepladder in textbook, pg. 325)

TASK STEPS:

1. Check condition of the window and frame.
2. Sweep frame and plane with brush.
3. Scrape off any loose or excess paint, then wipe clean.
4. Apply cleaner to window with sponge.
5. Rinse and clean sponge.
6. Remove excess water from pane with right size squeegee.
7. Wipe off excess water from window frame and floor area around window with a dry rag.
8. Clean and return equipment to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 111-1 in this guide.

2. Read all information listed in Task# 111. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 111 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Chekcklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Are windows panes clean with no streaks?		
2. Are window frames dry?		
3. Is floor area around windows dry?		
4. Was equipment cleaned and returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 111

INFORMATION SHEET 111-1

STUDY WORDS:

squeegee	- a T-shaped tool with a thin piece of rubber set in across the top. It is used to scrape water from a window surface
pane	- the glass part of a window
frame	- the wood or metal border around sides of glass
excess	- an amount larger than necessary

VERBS:

To scrape	- to rub the surface of something else
To sweep	- to clean with a brush or broom
To apply	- to put on to something else
To wipe	- to take off using a rag

TASK# 111

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean metal surfaces (brass, stainless steel, etc.)

TASK NO: 112

STUDENT WILL: Clean metal surfaces

GIVEN: Metal surfaces to be cleaned, supplies and equipment.

TOOLS & EQUIPMENT: wire brush, steel wool, solvents, metal cleaning polish, rags, and rubber gloves

TASK STEPS:

1. Scrub off any loose dirt or rust on metal with wire brush.
2. Scrub metal surface with coarse steel wool.
3. Finish scrubbing with steel wool that is not as coarse. Be careful not to leave scratch marks on metal. Metal finish should look smooth.
4. Mix solvent solution as indicated in directions on
   CAUTION: Be sure a door or window is open in work area. Shut off electrical power to appliances and motors. Wear rubber gloves.
5. Scrub surface with solvent solution.
6. Rinse with clean water and wipe dry.
7. Apply metal cleaning polish with rag.
8. Using another clean rag, rub metal surface until it is polished evenly.
9. Clean up work area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 112. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions listed in "TASK STEPS".

4. Fill-out checklist to see if you have completed Task# 112 correctly. See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Are all metal surfaces cleaned with no dirt or rust on them?		
2. Are metal surfaces in good condition with no scratchs or marks on them?		
3. Are all metal surfaces polished evenly?		
4. Was work area cleaned?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 112

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean upholstered furniture (material covered furniture)

TASK NO: 113

STUDENT WILL: Clean material on furniture

GIVEN: Upholstered furniture, supplies and equipment.

TOOLS & EQUIPMENT: concentrated rug shampoo, spray can of upholstery cleaner, scrub brushes, wet/dry vacuum, and rags

TASK STEPS:

1. Dry vacuum loose dirt from material on furniture.
2. Mix rug shampoo as indicated on label or use upholstery cleaner spray.
3. Apply shampoo to material using a sponge or spray on upholstery cleaner.
4. Scrub cleaner into material with brush. Scrub in and up an up and down and left to right pattern.
5. Remove all stains, but be sure that color of material stays even.
6. Remove excess liquid using wet/dry vacuum, make sure no cleaner is left on wood or metal parts of furniture.
7. Move furniture to an area where it can dry completely before using it.
8. Return all cleaning materials and equipment to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 113. See Competency Sheet in this guide.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
4. Fill-out checklist to see if you have completed Task# 113 correctly. See Student Evaluation Checklist in this guide.
5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were all stains removed form material?		
2. Did color of material stay even with no change in color?		
3. Was all cleaner removed from wood or metal parts of furniture?		
4. Was furniture moved from work area to dry?		
5. Were all cleaning materials and equipment returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 113

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Clean chalk boards (blackboards)

TASK NO: 114

STUDENT WILL: Clean chalkboards

GIVEN: A chalkboard that needs cleaning, supplies, and equipment.

TOOLS & EQUIPMENT: vacuum, clean rags, squeegee, bucket, and warm water

TASK STEPS:

1. Wipe off excess chalk for board.
2. Vacuum chalk dust from wood or metal edge at bottom of board.
3. Wash all of chalkboard areas with a sponge.
4. Remove excess water from chalkboard with squeegee. Make sure no streaks are left on board.
5. Clean and wipe off wood or metal parts of board with a clean rag.
6. Give time for chalkboard to dry. Do not dry with rag.
7. Clean erasers and place new chalk (material for writing) on board.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 114. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow insturctions in "TASK STEPS".

4. Fill-out checklist to see if you have completed Task# 114 correctly. See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is chalkboard clean with no streaks?		
2. Was all chalk dust removed from chalkboard area?		
3. Were all erasers cleaned?		
4. Was new writing chalk put on board?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 114

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Replace light bulbs and fluorescent tubes

TASK NO: 115

STUDENT WILL: Change light bulbs and fluorescent tubes

GIVEN: Light fixtures with light bulbs or fluorescent tubes

TOOLS & EQUIPMENT: stepladder, light bulbs, fluorescent tubes and starater swithces

TASK STEPS:

1. Turn off electric power to light.
2. Put stepladder in proper position (if possible, have somebody help you).
3. Remove any cover or reflector on light fixture.
4. Remove all bulbs and tubes from light fixture. Be sure to keep all bad bulbs and tubes separate from good ones.
5. Clean surfaces of good bulbs and tubes with a dry rag.
6. Replace bulbs and tubes.
7. Turn light on to see if it works.
8. Clean cover on light fixture and put back on.
9. Carry all bad bulbs and tubes to garbage compartment and break them.
10. Return stepladder and equipment to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 115. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

4. Fill-out checklist to see if you have completed Task# 115 correctly. See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Do light bulbs and fluorescent tubes work okay when switch is turned on?		
2. Are light reflectors or covers clean?		
3. Were all bad bulbs and tubes properly thrown out?		
4. Was stepladder returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 115

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Disassemble and clean buffing machine

TASK NO: 116

STUDENT WILL: Take apart and clean buffing machine

GIVEN: A buffing machine that needs cleaning, tools and supplies.

TOOLS & EQUIPMENT: buffing machine, vinegar solution, hot water, detergent, clean rags, wire brushes, pliers, wrench, putty knife

TASK STEPS:

1. Mix detergent with water.
2. Disconnect electric cord on buffing machine.
3. Remove buffing pads from under machine.
4. Wash pad in detergent and rinse in vinegar solution.
5. Hang up to dry.
6. Remove cleaning block from under machine.
7. Remove excess dirt on cleaning block with putty knife.
8. Scrub cleaning block with wire brush and detergent then rinse with vinegar solution.
9. Tighten loose nuts and bolts.
10. Wash cord on machine and rinse with vinegar solution.
11. Wash handle and wheels; rinse with vinegar solution.
12. Dry all parts using clean rags.
13. Return equipment storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 116. See Competency Sheet in this guide.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what tahe teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
4. Fill-out checklist to see if you have completed Task# 116 correctly. See Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is buffing machine clean with no dirt on it?		
2. Are all nuts and bolts tightened well?		
3. Was all equipment returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK# 116

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Disassemble and clean wet/dry vacuum

TASK NO: 117

STUDENT WILL: Take apart and clean a wet/dry vacuum

GIVEN: A wet dry vacuum with attachments (connecting parts)

TOOLS & EQUIPMENT: wet dry vacuum, detergent, hot water, vinegar solution, brushers, rags, and sponges

TASK STEPS:

1. Mix detergent with water.
2. Disconnect electric cord, wash and dry cord.
3. Disconnect hose, wand, handle, squeegee, and other attachments.
4. Wash attachments and rinse well. Make sure dirt and other material are cleaned out form inside attachments.
5. Flush attachments with vinegar solution. Let dry.
6. Scrub the inside of vacuum tank well.
7. Take care to clean the high water shut-of valve. Rinse completely then flush with vinegar solution.
8. Flush tank compartment that holds water and scrub well inside.
9. Dry tank compartment and around vacuum seal well with clean dry rags.
10. Clean wheels of machine and oil them a little if necessary.
11. Return all equipment to storage areas.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: The Good Housekeeping Procedure Manual
U.S. Govt. Printing Office, Ed.

LEARNING ACTIVITIES

1. Look at picture of wet/dry vacuum. See Information Sheet pg. 117-1 in this guide.
2. Read all information listed in Task# 117. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed Task# 117 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklilst to teacher to check.

TASK #17

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were all parts wiped clean with no marks left on them?f		
2. Were all dirt stains removed from machine?		
3. Were inside parts of attachments cleaned with no dirt or other material left inside them?		
4. Were all attachments permitted to dry?		
5. Was all equipment returned to proper storage areas?		

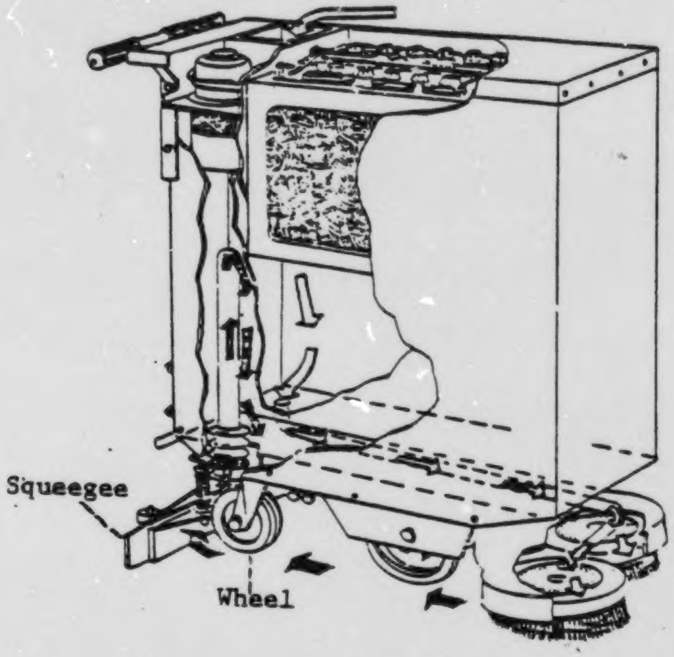
TOTAL POINTS EARNED =

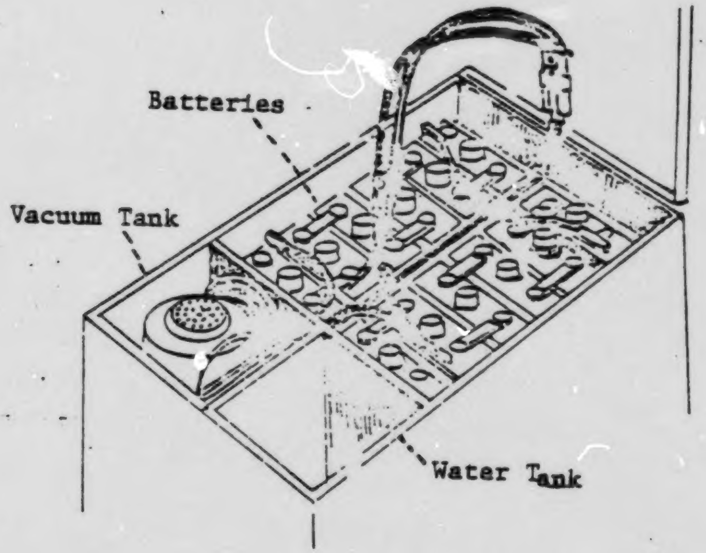
POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 117

INFORMATION SHEET 117-1

Wet/Dry Vacuum


Squeegee
Wheel


Batteries
Vacuum Tank
Water Tank

Resource# 1

The Good Housekeeping
Procedure Manual
U.S. Govt. Printing Office, Ed., 1976,
Fig. v-12

Program	Task	Page
	117	1

BEST COPY AVAILABLE

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Custodial Related Duties

JOB TASK: Control of insect and rodent problems

TASK NO: 118

STUDENT WILL: Take proper action to eliminate the insects and rodents

GIVEN: An area that is infested with insects or rodents, information on correcting problem, supplies and equipment.

TOOLS & EQUIPMENT: traps, bait, and pest control chemicals

TASK STEPS:

1. Examine area to find out what type of insects or rodents are there.
2. Read information on correct types of pest controls to use. See your textbook, pgs. 159 to 162.
3. Put pest traps or bait in infested areas. Take care that children or pets cannot reach them.
4. Check infested area every morning to find out if the action you are taking is working.
5. Dispose of any pests that are collected.
6. Continued actions that work until all pests are gone.
7. Remove all traps, bait, and chemicals from area when pest problem is controlled.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 118-1.
2. Read all information listed in Task# 118. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed Task# 118 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE OBSERVED	RATING YES	RATING NO
1. Were traps or bait in areas where children could not reach them?		
2. Was infested area checked every day?		
3. Were traps or bait replaced when needed?		
4. Were pests eliminated?		
5. Were all traps or bait removed from area after pest problem was controlled?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 118

INFORMATION SHEET

STUDY WORDS:

rodent	- a mouse, rat, etc.
pests	- insects or rodents
trap	- a piece of equipment used to catch animals
bait	- food or other substance that is put in a trap to make a rodent want to go there to eat

VERBS:

To infest/infested	- when pests are present in an area in large numbers
To dispose of	- to throw away, to eliminate

EXPRESSIONS:

left over	- something that was put in a place earlier and is still there now

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Cut and plane a board to width and length and cut inside and outside curves

TASK NO: 200

STUDENT WILL:
1. Measure and layout a board using ruler, square, and bevel
2. Cut a board to indicated length and width
3. Plane edges smoothly
4. Cut inside and outside curves

GIVEN: A board (long, flat piece of wood), tools and equipment.

TOOLS & EQUIPMENT: measuring tools, pencil, square, T bevel, hand saw, jack plane, coping saw, crosscut saw, rip saw, and marking gauge

TASK STEPS:

1. Measure and layout a board as teacher indicates.
2. Cut board to length using a crosscut hand saw.
3. Cut width of board to 1/8 inch of finished width using a rip saw.
4. Mark the width of board with marking gauge.
5. Plane board to proper width using jack plane.
6. Cut outside curves using a coping saw.
7. Cut inside curves using a coping saw.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be present in this task. See Information Sheet 200-1, in this guide.

2. Look at pictures of tools that will be presented in this task. See textbook pgs. 10-42.

3. Read all information listed in Task# 200. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Fill-out checklist to see if you have completed Task# 200 correctly. See Student Evaluation Checklist in this guide.

7. Give completed Student Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was board cut to proper length?		
2. Was board cut to proper width?		
3. Are outside curves made correctly?		
4. Are inside curves made correctly?		
5. Are ends of board equal and even?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 200

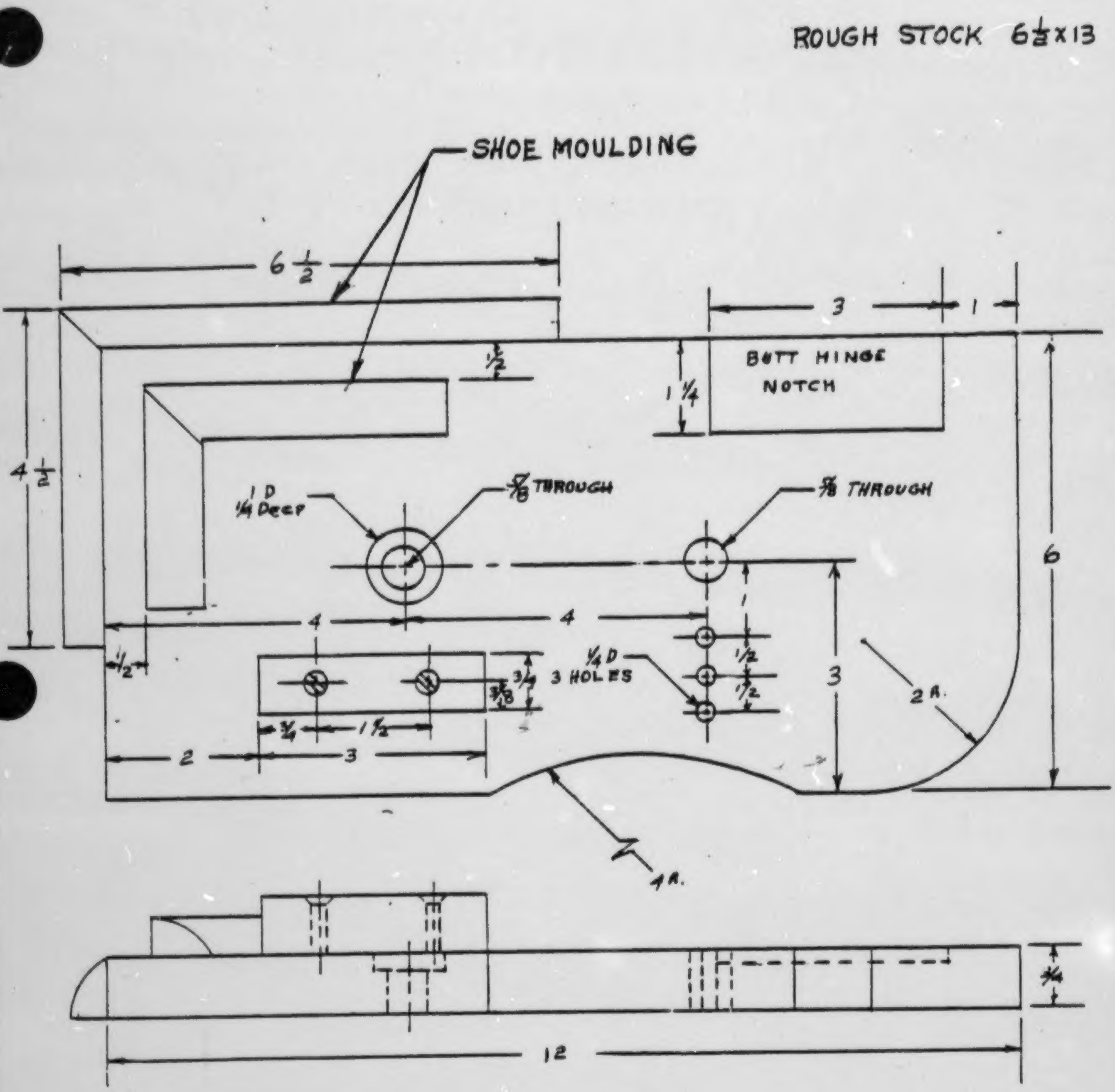
INFORMATION SHEET 200-1

STUDY WORDS:

angle	- the shape, made by two straight lines meeting in a point
plane	- a tool used to make the surface of wood smooth
crosscut	- to cut across the wood grain (see textbook pg. 60)
rip cut	- to cut in the direction of the wood grain (see textbook pg. 60)
width	- a measure of how wide something is, th distance from one side to the other side

VERBS:

To plane, planing	- to share the surface of a piece of wood until it is smooth


ROUGH STOCK 6½ X 13
SHOE MOULDING
6 1/2
3
1
1/2
1 1/4
BUTT HINGE NOTCH
4 1/2
1 D
1/4 DEEP
5/8 THROUGH
5/8 THROUGH
6
4
4
1
1/4 D
3 HOLES
1/2
1/2
3
2 R.
1/2
3/4
3/16
3/4
1 1/2
2
3
4 R.
3/4
12

Resource:
PREVIEWS CURRICULUM

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Cut molding to fit inside and outside corners using a miter box

TASK NO: 201

STUDENT WILL: Cut correct angles on molding

GIVEN: Molding, tools, and supplies.

TOOLS & EQUIPMENT: miter box, miter box saw, measuring tools, combination square, pencil, hammer, nails, nail set

TASK STEPS:

1. Mark length of molding using combination square.
2. Adjust miter box saw to angle being cut. See example in textbook pg. 103.
3. Cut molding for outside corner a long marked line. Make sure all cut edges are smooth and clean.
4. Reverse miter box saw angle and cut molding to match the first piece cut.
5. Put cut ends together to make a joint then nail them to bottom of wall. Make sure you hammer the nails in until they are just below the surface of the molding.
6. Follow the same steps to cut molding for inside corners.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each ite.

RESOURCES: Textbook - Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. In carpentry tasks you will be asked to cut wood along marked lines and angles. Study these shapes. See Information Sheet 201-1, in this guide.

2. Look at pictures and read information about doing this task. See textbook pg. 102 and 103.

3. Read all information listed in Task# 201. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Fill-out checklist to see if you have completed Task# 201 correctly. See Student Evaluation Checklist in this guide.

7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were all cut edges smooth and clean?		
2. Does molding joint on the outside corner fit and match properly when nailed to wall?		
3. Does molding joint on the inside corner fit and match properly when nailed to wall?		
4. Were nails hammered in until they were just below surface on the molding?		

TOTAL POINTS EARNED =

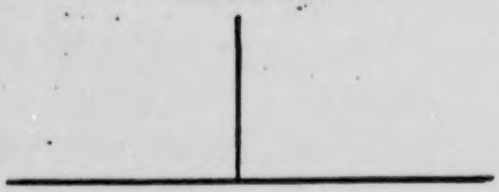
POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 201

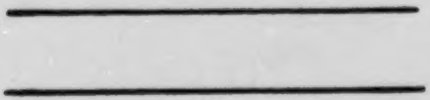
INFORMATION SHEET 201-1

This is a horizontal line.

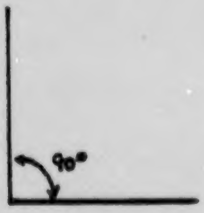
This is a vertical line.



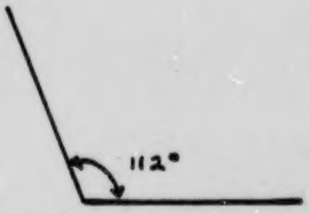
These lines are perpendicular.



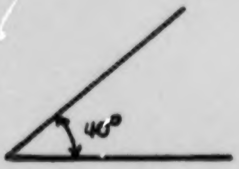
These lines are parallel.



This is a right angle.
It has 90 degrees.

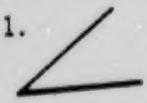


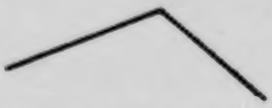
This is an obtuse angle. It has more than 90 degrees.

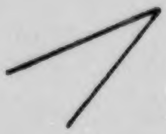


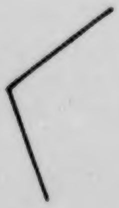
This is an acute angle. It has less than 90 degrees.

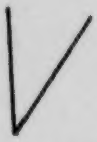
Exercise I
Are these right angles, obtuse angles or acute angles?

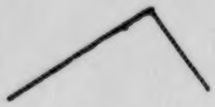
1. 

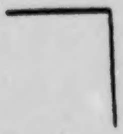
2. 

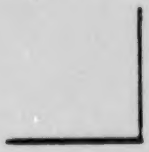
3. 

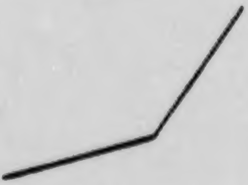
4. 

5. 

6. 

7. 

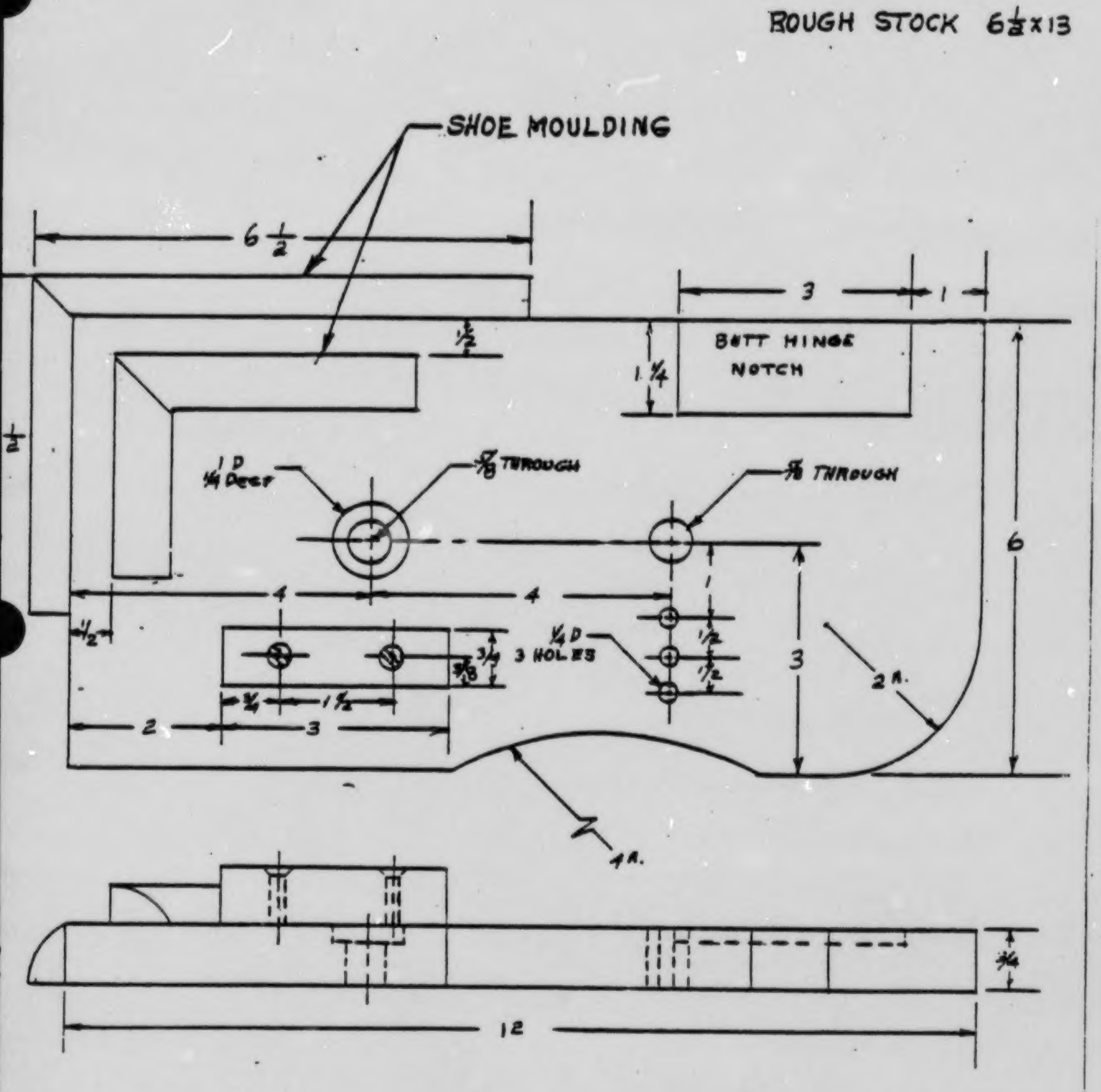
8. 

9. 

Draw a right angle, an obtuse angle and an acute angle on the back of the page.

RESOURCES **Previews Curriculum**

INFORMATION SHEET 201-2


ROUGH STOCK 6½x13
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1 D ¼ DEEP
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½
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2 R.
¾
⅜
¾
1 ½
2
3
4 R.
¾
12

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Drill and bore holes of different diameters and depths using hand operated drills

TASK NO: 202

STUDENT WILL: Drill and bore holes of different diameters and depths in woods

GIVEN: A piece of wood, tools and supplies.

TOOLS & EQUIPMENT: various hand drills, auger bits, bit brace, screwdriver, measuring tools, pencil, combination square, flat head screws

TASK STEPS:

1. Mark location of all holes you are going to make.

2. Using a bit brace, bore large hole to proper depth, about halfway into thickness of wood. (This kind of hole is called a "blind hole.")

3. Using an auger bit bore a smaller hole in center of larger hole. Stop boring when lead screw (see picture in textbook pg. 27) comes through backside of wood.

4. Bore same hole from backside of wood using an auger bit. Make this hole smaller. Backside of all holes should be clean and not splintered. (See picture in textbook pg. 26)

5. Drill other small holes using different hand drills.

6. Countersink holes for flat head screws. (See picture in textbook pg. 73)

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet 202-1, in this guide.

2. Read all information listed in Task# 202. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 202 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	RATING NO
1. Are all holes in the right place?		
2. Are all holes of correct size?		
3. Is large hole (blind hole) of the correct depth?		
4. Is the backsides of the smaller hole clean and not splintered?		
5. Do all flat head screws fit properly into counter sunk holes?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 202

INFORMATION SHEET 202-1

STUDY WORDS:

diameter	- a straight line passing through the center of a circle
thick (adj.) / thickness (n.)	- the opposite of thin
backside	- the back part, behind
depth	- the distance from the top of a surface downward

VERBS:

To bore	- to make a hole with a tool that turns Example: a drill
To countersink/countersunk	- to make the top part of a hole larger so that the flat head of the screw will fit even with or below the surface of the wood
splinter/splintered	- to break into thin sharp pieces

EXPRESSIONS:

blind hole	- a hole in the wood that does not go all the way through.

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Chisel out a notch (opening) for a door hinge

TASK NO: 203

STUDENT WILL: Chisel out a notch for a door hinge

GIVEN: A door, tools and supplies.

TOOLS & EQUIPMENT: Measuring tools, sharp pencil, chisels, butt hinge and screws, screwdriver, and hammer

TASK STEPS:

1. Mark with pencil the outline (pattern) of the butt hinge at the proper location on door.
2. Chisel straight down along hinge outline to approximate thickness of hinge.
3. Chisel out inside of hinge notch. (Follow steps presented in textbook pg. 141).
4. Chisel out the bottom of notch to correct depth. Bottom should be chiseled evenly. Butt hinges should be level with door edge when it is placed in notch.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at steps in process you will do in this task. See your textbook pg. 141.

2. Read all information listed in Task# 203. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 203 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is the butt hinge notch in the proper location?		
2. Is the depth of the notch the same as the thickness of the butt hinge?		
3. Is notch the correct length and width for butt hinge?		
4. Are edges of notch clean and not splintered?		
5. Is butt hinge even with door edge when hinge is placed in notch?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 203

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE MAINTERNANCE

DUTY TITLE: Carpentry Related Duties

JOB TASK: Cut length and width of a board using a portable circular saw; cut inside and outside curves using a protable saber saw

TASK NO: 204

STUDEN WILL: Cut length and width of a board using a portable circular saw, then cut inside and outside curves using a portable saber saw

GIVEN: A board and the necessary tools and equipment.

TOOLS & EQUIPMENT: portable circular saw, jack plane, combination square, pencil, marking gauge, portable saber saw, measuring tools

TASK STEPS:

1. Using a portable circular saw, cut across one end of board. Measure cut end with combination square to make sure cut is straight.
2. Using ruler and pencil, mark the length needed then cut across opposite end of board with circular saw.
3. Measure cut end with combination square to make sure cut is straight.
4. Mark and plane board to width needed. (See examples in your textbook pgs. 25 and 28)
5. Using a saber saw, cut an outside curve on board. (See example in your textbook pg. 52)
6. Using a saber saw, cut an inside curve on board.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read and study about power tool safety. See Information Sheet pg. 204-1, in this guide.

2. Do exercise to see how well you understand proper power tool safety. See Information Sheet pg. 204-2, in this guide.

3. Look at pictures of tools and processes you will use to do this task. See your textbook pgs. 24-28 and 48-52, also, Information Sheet 204-3

4. Read all information listed in Task# 204. See Competency Sheet in this guide.

5. Ask teacher to demonstrate this task. See teacher.

6. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

7. Fill-out checklist to see if you have completed Task# 204 correctly. See Student Evaluation Checklist in this guide.

8. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are both ends of board cut straight?		
2. Are the length and width of board correct?		
3. Is the outside curve correct?		
4. Is the inside curve correct?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 204

INFORMATION SHEET 204-1

PORTABLE POWER TOOL SAFETY

I. Terms and Definitions

A. Maintenance - The care and upkeep of equipment

B. Feed - The speed the blade, bit, or cutter of a power tool is moved into the material.

C. Portable - Light and easily movable tools that are usually hand-held during operation.

D. RPM - The number of turns in a minute of a blade, bit, or cutter in a power tool

E. Margin of Safety - Keeping hands away from the blade, bit, or cutter a specified distance at all times.

II. General Power Tool Safety

A. Know the operating procedures of each machine before you use it.

B. Be alert when operating power tools.

C. Make all adjustments with power tools turned off.

D. Do not allow others to distract you.

E. Keep any safety guards or covers in place.

F. Wear safety glasses when using or around power tools.

G. Be sure cords and plugs are not cracked or have bare spots.

H. Develop a good safety attitude.

I. Have permission from your instructor before operating power tools.

J. Do necessary maintenance on power tools before using.

K. Wear proper clothing. Loose shirt sleeves can get caught on power tools.

L. Do not wear ring or watches when operating power tools.

M. Be sure that all power tools are "grounded". This means that each tool cord should have a three pronged plug attached to it.

INFORMATION SHEET 204-1

PORTABLE POWER TOOLS EXERCISE

Exercise XV

1. Match the word on the right to the correct definition on the left by placing the number in the blank.

_____ a. The care and upkeep of equipment

_____ b. The speed the blade, bit, or cutter of a power tool is moved into the material

_____ c. Light and easy to move tools that are usually hand-held during operation.

_____ d. The number of turns in a minute of a blade, bit, or cutter in a power tool.

_____ e. Keeping hands away from the blade, bit, or cutter a specified distance at all times.

1. RPM
2. Margin of Safety
3. Maintenance
4. Feed
5. Portable

2. Select the correct general safety rules for using power tools by placing a "✓" in front of each correct sentence.

_____ a. Know the operating procedures of each machine after you use it.

_____ b. Be alert when operating power tools.

_____ c. Make adjustments with power tools turned off.

_____ d. Do not allow others to distract you.

_____ e. Remove any safety guards.

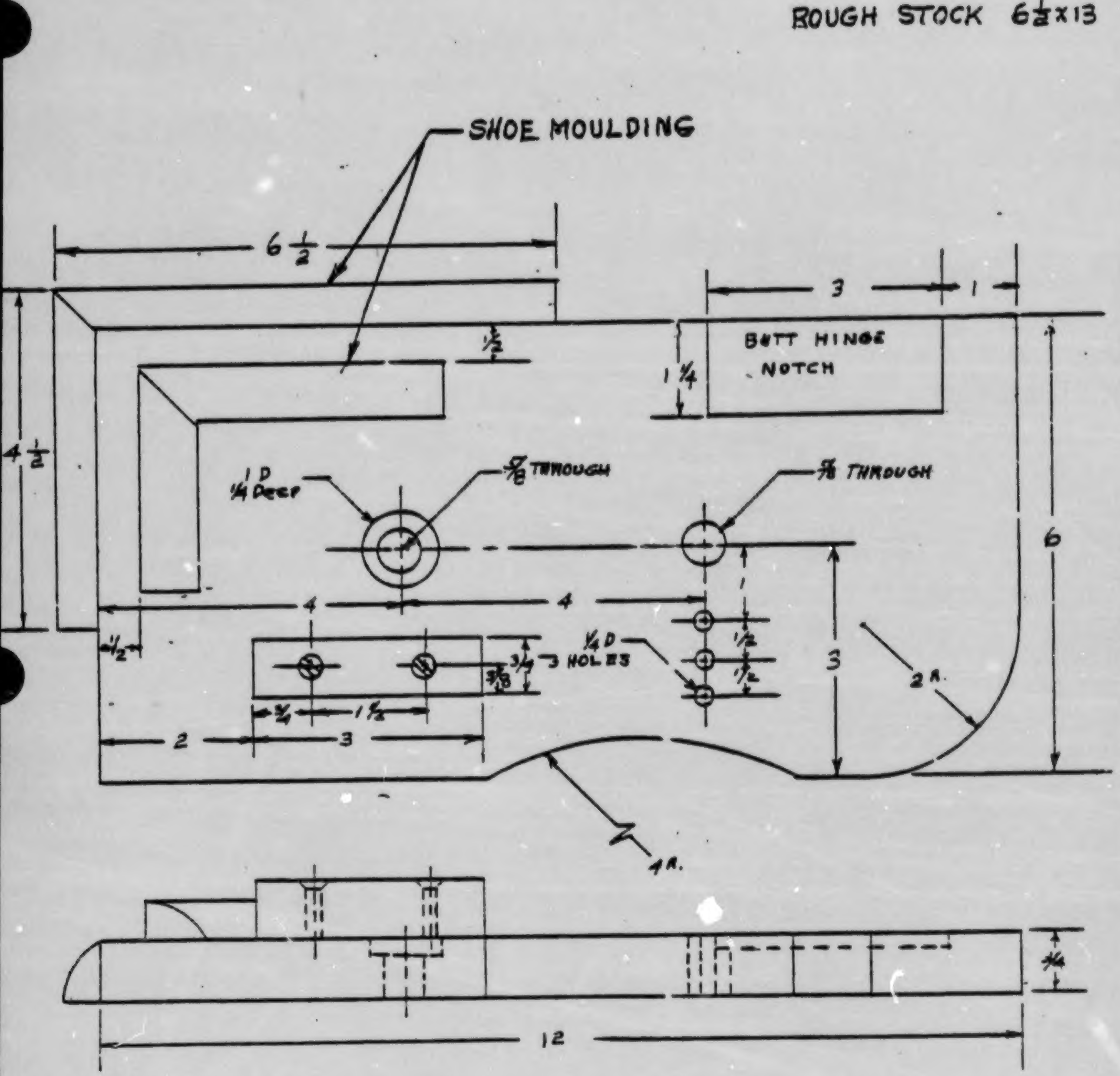
_____ f. Wear safety glasses when using or around power tools.

_____ g. Be sure machines and plugs are in good condition.

_____ h. Develop a good safety attitude.

_____ i. Have permission from your instructor before operating power tools.

_____ j. Let your instructor do all maintenance of tools.


ROUGH STOCK 6½x13
SHOE MOULDING
6 1/2
3
1
BUTT HINGE NOTCH
1/2
1 1/4
4 1/2
1 D 1/4 DEEP
5/8 THROUGH
5/8 THROUGH
6
4
4
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1/2
1/2
1/4 D 3 HOLES
3/4
3/8
3
2 R.
3/4
1 1/2
2
3
4 R.
3/4
12

Resource:
PREVIEWS CURRICULUM

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Drill and bore holes using powered hand drills

TASK NO: 205

STUDENT WILL: Drill and bore holes

GIVEN: A piece of wood, powered tools, and equipment.

TOOLS & EQUIPMENT: powered hand drills, high speed drills, bits, measuring tools, combination square, pencil and flat head screws

TASK STEPS:

1. Mark location of all holes you are going to make.
2. Using a speed drill, bore a large "blind hole" to recommended depth.
3. Using an auger bit, bore a smaller hole in center of larger "blind hole." Stop when lead screw comes through the backside of the wood.
4. Using an auger bit, bore same hole from backside of wood make this hole smaller. Backside of hole should be clean and not splintered.
5. Drill other small holes using regular drill bits. Countersink holes for flat head screws. (See picture in textbook pg. 73)

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of power drills and bits you will use to do this task. See your textbook pgs. 44-45.
2. Look at outline for cutting holes. See information Sheet 205-1.
3. Read all information listed in Task# 205. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
6. Fill-out checklist to see if you have completed Task# 205 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

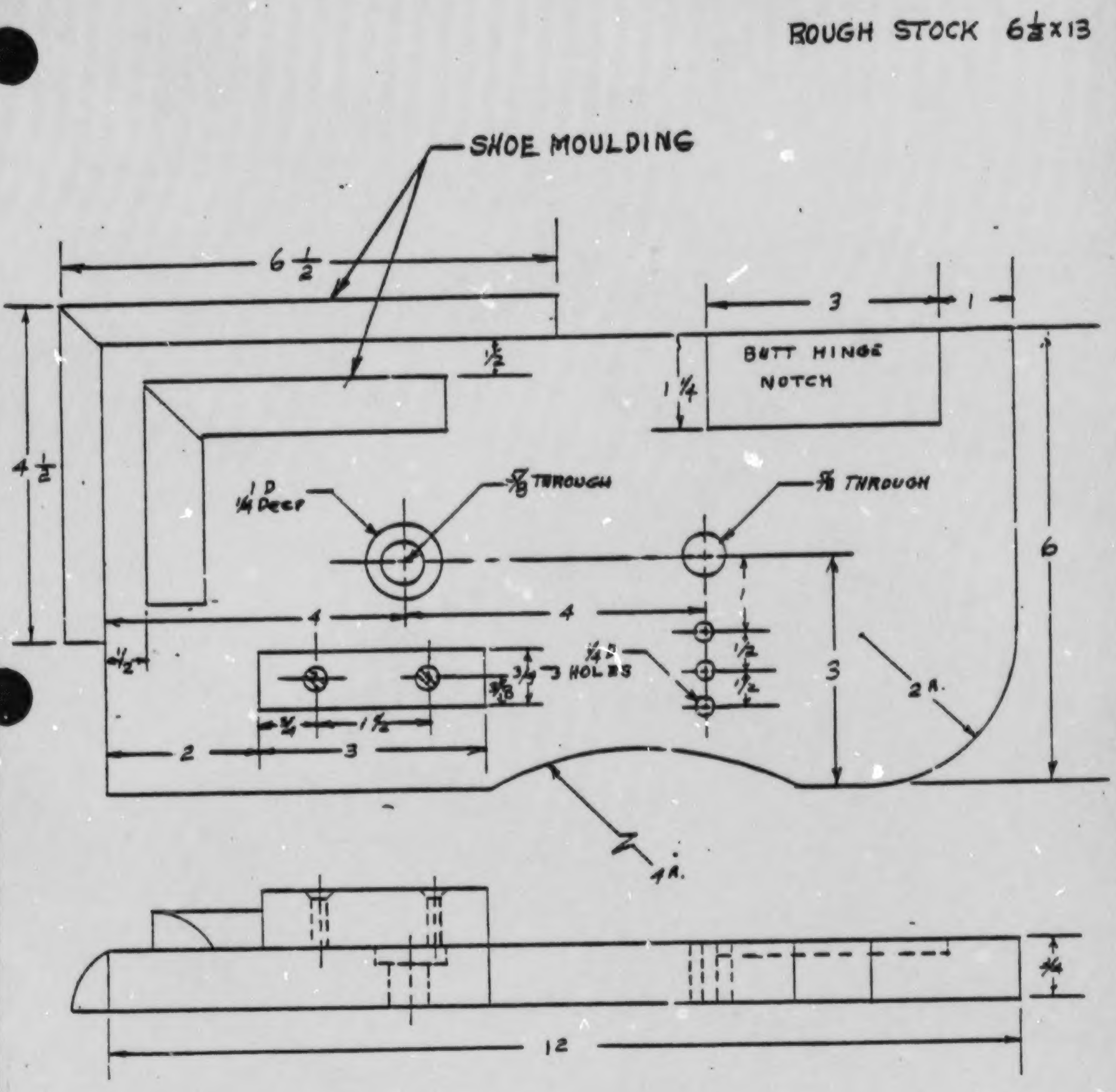
ITEMS TO BE CHECKED	RATING YES	 NO
1. Are all holes in the right place?		
2. Are all holes of correct size?		
3. Is the "blind hole" of correct depth?		
4. Is the backsides of the smaller hole clear and not splintered?		
5. Do all flat head screws fit properly into countersunk holes?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 205

INFORMATION SHEET 205-1


ROUGH STOCK 6½ x 13
SHOE MOULDING
6½
3
1
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1¼
BUTT HINGE NOTCH
4½
1 D
¼ DEEP
⅞ THROUGH
⅝ THROUGH
6
4
4
½
¼ D
3/8
3/8
3 HOLES
1
½
½
3
2 R.
¾
1½
2
3
4 R.
¾
12

Resource:
PREVIEWS CURRICULUM

BEST COPY AVAILABLE

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Using a portable router, cut a notch (opening) for a door hinge

TASK NO: 206

STUDENT WILL: Cut a notch on a door for a butt hinge

GIVEN: A door, butt hinge, tools and equipment.

TOOLS & EQUIPMENT: portable router, router guide and bits, measuring tools, pencil, and butt hinge

TASK STEPS:

1. Measure thickness of door to know where you are going to set the router guide.
2. Mount router guide on door edge at proper location.
3. Adjust router bit to proper depth of cut.
4. Using router, cut out notch on door edge for butt hinge. Keep all edges of notch clean and smooth.
5. Remove router guide from door edge. Butt hinge should be level with door edge where it is placed in notch.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Texrbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and equipment you will use to do this task. See your textbook pgs. 54-55.
2. Read all information listed in Task# 206. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out the checklist to see if you have completed Task# 206 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

	ITEMS TO BE CHECKED	RATING	
		YES	NO
1.	Is door notch in proper position?		
2.	Is door notch cut to proper depth?		
3.	Are edges of notch clean and smooth?		
4.	Is notch the correct length and width fro butt hinge?		
5.	Is butt hinge even with door edge when hinge is placed in notch?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 206

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Sand the surface of a board using orbital and belt sanders

TASK NO: 207

STUDENT WILL: Sand (rub of) the surface of a board using orbital and belt sanders

GIVEN: A board, tools and equipment.

TOOLS & EQUIPMENT: orbital sander, belt sander, sandpaper belts and pads, shop vacuum

TASK STEPS:

1. Place board on a flat surface. Secure one end of board to keep it from moving back.
2. Check to see that switches on sanders are in the "off" position before plugging in electrical cord.
3. Using an orbital sander sand the boards's flat surface. Move sander along board in half circle motions. Be careful not to sand edges of board too much, because they will become round.
4. Using a belt sander sand the board's flat surface with a back and forth motion.
5. Clean-up saw dust (tiny wood particles) from work area with shop vacuum.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See pictures of tools you will use to do this task. See your textbook pg. 57.

2. Read all information listed in Task# 207. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 207 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was switch on each sander in the "off" position before plugging in electrical cord?		
2. Are edges of board sharp and not rounded?		
3. Is the surfaces of the board smooth?		
4. Was work area cleaned?		
5. Did student wear safety glasses?		
6. Was electic cord on sander in good condition?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 207

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Crosscut and rip wood on a table saw

TASK NO: 208

STUDENT WILL: Crosscut and rip wood on a table saw

GIVEN: Table saw and wood to be cut.

TOOLS & EQUIPMENT: measuring tools, pencil, and wood cutting table saw safety glasses, push stick

TASK STEPS:

1. Put on safety glasses.
2. Check to see that machine switch is in "off" position before you connect cord. Make sure cord has a three pronged plug on it.
3. Adjust table saw blade to just above thickness of wood.
4. Adjust miter gauge as needed.
5. Stand to one side of cutting blade and crosscut wood to length. See textbook pg. 60.
6. Adjust miter gauge and crosscut wook using various angular cuts.
7. Tilt blade and crosscut wood at a bevel.
8. Adjust rip fence and rip cut to proper width. See textbook pg. 60. Be sure to stand to one side of cutting blade when operating saw.
9. Adjust rip fence and rip cut wood to a narrower width using a push stick. See textbook pg. 60.
10. Adjust rip fence, tilt blade, and rip cut to a bevel.
11. Clean work area.
12. Return tools to storage room.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook--Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet 208-1, in this guide.

2. Look at pictures of tools and processes you will use to do this task. See textbook pg. 60.

3. Read all information listed in Task# 208. See Competency Sheet in this guide.

4. Ask teacher to demonstrate Task# 208. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Fill-out checklist to see if you have completed Task# 208 correctly. See Student Evaluation Checklist in this guide.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was cutting blade adjusted to just above thickness of wood?		
2. Did student wear safety glasses?		
3. Did student stand to one side of cutting blade when operating machine?		
4. Was crosscut made evenly for length needed?		
5. Were angular crosscuts made correctly?		
6. Was bevel on crosscut work made correctly?		
7. Was wood rip cut to correct width?		
8. Did student use push stick when rip cutting a narrower width on wood?		
9. Was bevel on rip cut work made correctly?		
10. Was work area clean?		
11. Were tools returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 11
TOTAL POINTS POSSIBLE = 11

TASK# 208

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Crosscut and rip cut wood using a radial arm saw

TASK NO: 209

STUDENT WILL: Crosscut and rip cut wood to size

GIVEN: Wood to be cut on a radial saw, supplies and equipment.

TOOLS & SUPPLIES: measuring tools, pencil, wood cutting radial arm saw, safety glasses

TASK STEPS:

1. Put on safety glasses.
2. Adjust saw blade height and crosscut end of wood evenly.
3. Tilt saw blade and crosscut a bevel as teacher indicates.
4. Turn off motor and swing saw motor to a 90 angle (see example in textbook pg. 61.)
5. Adjust radial arm and position ripping hold down properly.
6. Rip cut wood to width indicated.
7. Turn off motor and tilt blade.
8. Turn on motor and rip cut a bevel as indicated.
9. Clean work area.
10. Return tools to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See pictures of tools and processes you will use to do this task. See textbook pg. 61.
2. Read all information listed in Task# 209. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to make sure you have completed Task# 209 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student adjust saw blade height properly for cross cutting end of wood?		
2. Did student crosscut wood evenly and to proper length?		
3. Did student crosscut wood to proper bevel?		
4. Did student wear safety glasses?		
5. Did student turn off motor each time machine was adjusted?		
6. Did student swing saw motor to a 90 angle before rip cutting wood to width indicated?		
7. Did student rip cut wood to correct width?		
8. Did student rip cut wood to proper bevel?		
9. Did student clean up area?		
10. Were tools returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 10
TOTAL POINTS POSSIBLE = 10

TASK# 209

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Cut curved edges on a band saw

TASK NO: 210

STUDENT WILL: Cut curved edges on a band edges

GIVEN: A piece of wood, supplies and equipment.

TOOLS & EQUIPMENT: measuring tools, pencil, wood cutting band saw, and safety glasses

TASK STEPS:

1. With saw motor shut off, adjust table to 0 angle and blade guide height a little above the wood.
2. Put on safety glasses and remove any rings, watches, etc. Make sure shirt sleeves are out of the way of the machine.
3. Using pencil mark curve outline on edges of wood as indicated.
4. Turn on saw motor and cut curved edges closest to blade guage. Turn off saw motor each time you finish a piece of work.
5. Using pencil, outline scallops along the length of one side of wood then cut scallops by backing wood out of the saw blade. See examples in textbook pg. 63 or look at section in textbook on "BAND SAW".
6. Using a pencil, outline a small curve then cut curve by making several forward cuts along marked line.
7. Clean work area.
8. Put tools in tool room.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of band saw and processes used to do this task. See textbook pg. 63 and Information Sheet pg. 210-1.
2. Read all information listed in Task# 210. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet in this guide.
5. Fill-out checklist to see if you have completed Task# 210 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were table and blade guide adjusted correctly?		
2. Were curved edges cut along marked outline?		
3. Were scallops cut along marked outline?		
4. Was small curve cut along marked outline?		
5. Did student follow safety recommendations when using machine?		
6. Did student wear safety glasses?		
7. Was area cleaned up?		
8. Were tools returned to storage area?		

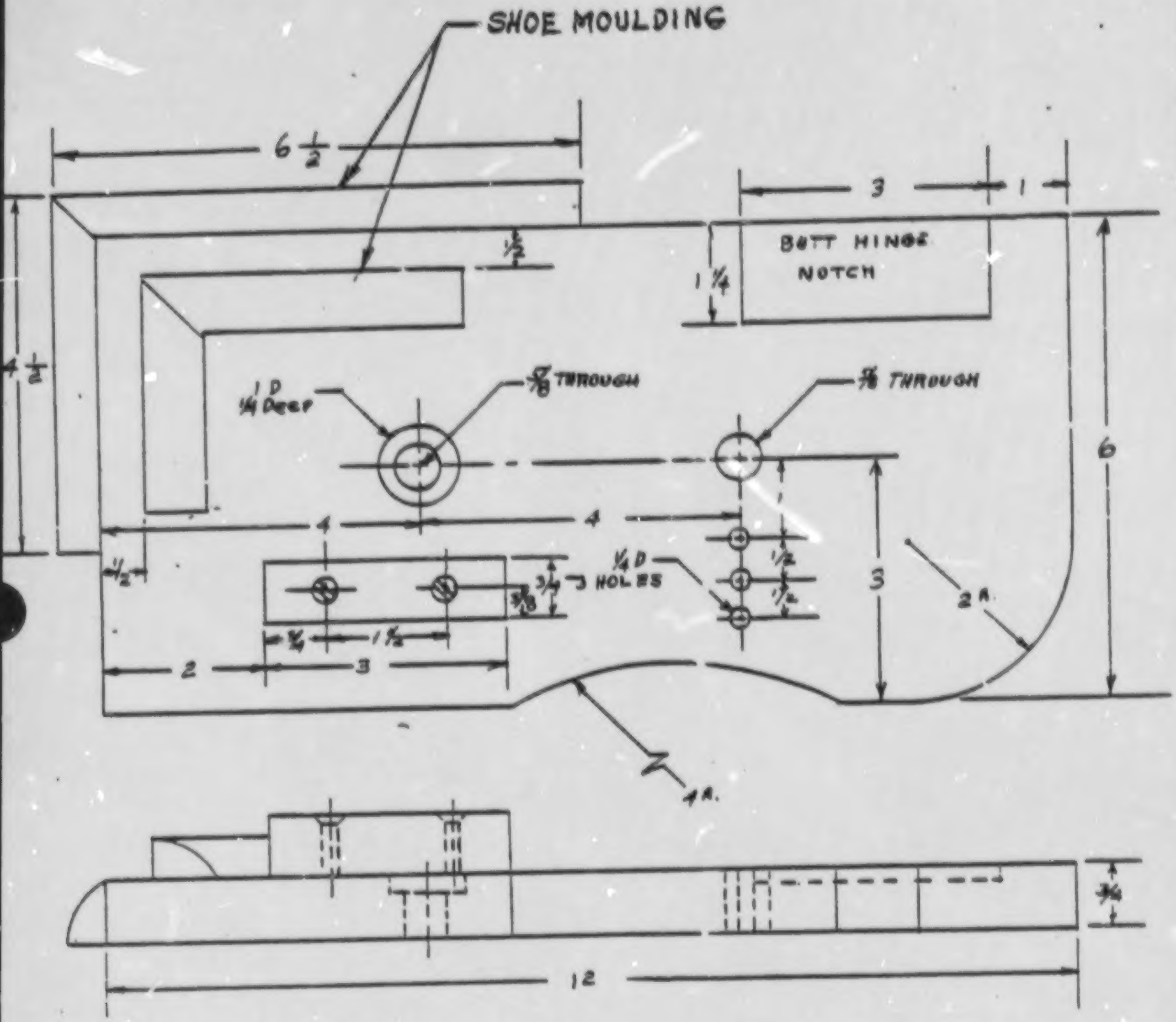
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 210

INFORMATION SHEET 210-1

ROUGH STOCK 6½x13


SHOE MOULDING
6 1/2
3
1
BUTT HINGE NOTCH
1/2
1 1/4
4 1/2
1 D 1/4 DEEP
5/8 THROUGH
5/8 THROUGH
6
4
4
1/2
1/4 D 3 HOLES
3/4
3/8
1/2
1/2
3
2 R.
3/4
1 1/2
2
3
4 R.
3/4
12

Resource:
PREVIEWS CURRICULUM

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Plane edges and surfaces with jointer

TASK NO: 211

STUDENT WILL: Plane edges and surfaces of wood using jointer

GIVEN: Wood, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, combination square, pencil, wood cutting jointer, safety glasses

TASK STEPS:

1. Adjust front table for proper depth of cut you are going to make. Be sure machine switch is in "off" position.
2. Adjust fence for right angle cut.
3. Turn on machine and cut edge of wood move fence as needed to cut full width of edge. Hold board firmly on the front table and against the fence with both hands.
   CAUTION: Keep hands over the table not near cutting blade.
4. Measure with combination square to make sure edge is even.
5. Plane one end of board. Make a short cut on one side then turn board over and finish cut on reverse side.
6. Plane surface of board. Use a hold-down push stick to move board along machine, not your fingers.
7. Put on safety glasses.
8. Clean up work area.
9. Put tools away.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook- Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at picture on jointer and process you will use to do this task. See textbook pg. 64.
2. Read all information listed in Task# 211. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instrctions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 211 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was front blade adjusted correctly?		
2. Was fence adjusted correctly?		
3. Is edge of board smooth and straight?		
4. Is end of board smooth and straight?		
5. Is surface of board flat and smooth?		
6. Did student follow safety recommenditions?		
7. Did student wear safety glasses?		
8. Did student clean up area?		
9. Were tools put away?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 211

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Bore (cut) holes to various depths and diameters

TASK NO: 212

STUDENT WILL: Bore holes to various depths and diameters

GIVEN: A piece of wood, tools, various boring bits, drill depth gauge, drill press, safety glasses, and clamp.

TOOLS & EQUIPMENT: measuring tools, various boring bits, drill press, safety glasses, and clamp

TASK STEPS:

1. Put on safety glasses.
2. Measure and mark on board the location for each hole.
3. Mount board on table with clamp.
4. Bore large blind hole to proper depth.
5. Bore medium hole through center of large hole. Stop when point of bit just comes through the bottom of board.
6. Bore medium hole again, but from backside of wood, Make sure backside of hole is not splinteted.
7. Bore the small holes to proper depth. Use a drill depth gauge.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of drill press and processes you will use to to this task. See textbook pg. 66.

2. Read all information listed in Task# 212. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheete and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 212 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were holes measured and marked correctly?		
2. Was large hole bored to proper depth?		
3. Is backside of medium hole smooth?		
4. Were small holes bored to proper depth?		
5. Did student wear safety glasses?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 212

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Cut molding with a powered miter saw

TASK NO: 213

STUDENT WILL: Cut and install molding

GIVEN: Two pieces of molding, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil, combination square, nails, hammer, powered miter saw and two pieces of molding, safety glasses

TASK STEPS:

1. Measure and mark molding to be cut as indicated.
2. Adjust saw blade depth as indicated.
3. Adjust saw to a 45 angle (See textbook pg. 103).
4. Put a piece of molding in position against saw fence and make the angle cut (See textbook pg. 399).
5. Adjust saw to an opposite 45 angle.
6. Put a second piece of molding in position against saw fence and make the angle cut.
7. Put cut ends of both pieces together to make a tight joint, then nail them to bottom of wall. Make sure you hammer the nails in until they are just below the surface of the molding.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of process you will use for this task. See textbook pgs. 102, 103, and 399.

2. Read all information listed for Task# 213. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See Teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 213 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was saw blade depth adjusted correctly?		
2. Were saw blade angles adjusted correctly?		
3. Was molding cut correctly?		
4. Does molding joint fit tightly?		
5. Did student wear safety glasses?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 213

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Cut a rabbet joint on bench saw

TASK NO: 214

STUDENT WILL: Cut a rabbet joint on bench saw

GIVEN: Wood to be cut for a rabbet joint, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil wood, bench saw, safety glasses, glue, hammer, and nails

TASK STEPS:

1. Put on safety glasses.
2. Measure and mark thickness of wood for rabbet cut.
3. Adjust bench saw blade to depth of rabbet joint (See textbook pg. 60).
4. Adjust rip fence for width of rabbet joint.
5. Rip cut the depth of rabbet joint.
6. Adjust saw blade to width of rabbet cut. Be sure to take into consideration the thickness of the saw blade when cutting wood.
7. Rip cut the width of rabbet joint.
   CAUTION: Stand on one side of saw blade not behind it.
8. Check to see that joints fits corner as indicated (See textbook pg. 392).
9. Apply glue and hammer the nails into joint.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures that show and describe a rabbet cut on wood. See textbook pgs. 55, 64, and 392.

2. Read all information listed in Task# 214. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 214 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is the depth of rabbet joint the same all the way along cut?		
2. Is rabbet joint depth correct?		
3. Is the width of the rabbet joint the same all the way along cut?		
4. Are both cuts even and smooth?		
5. Does rabbet joint fit correctly?		
6. Did student wear safety glasses?		
7. Did student stand on one side of bench saw blade with using machine?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 214

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Make dowel glue joints

TASK NO: 215

STUDENT WILL: Make dowel glue joints

GIVEN: Two pieces of wood to be joined, dowels, and equipment.

TOOLS & EQUIPMENT: measuring tools, pencil, combination square doweling jig, straight drills, jack plane or jointer, drill stop, dowel pins, two boards, clamp, and safety glasses

TASK STEPS:

1. Put on safety glasses.
2. Make smooth and straight edges of the wood to be joined using a jack plane or jointer.
   CAUTION: Keep hands away from blade area.
3. Measure and mark position of dowel pins on boards as indicated. Use a combination square.
4. Drill dowel holes to proper depth into each board using a hand drill, doweling jig, and drill stop.
5. Put glue on dowel pins and push dowels to half their length into one board.
6. Put glue along the edges and holes of the second board.
7. Fit the holes of the second board over the dowel pins and push the two boards together tightly.
8. Using clamp, tighten joint.
9. Remove excess glue around edges of joint and let joint dry.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at picture of a dowel glue joint. See textbook pg. 395.
2. Read all information listed in Task# 215. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 215 correctly.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Were dowel holes drilled properly on each board?		
2. Was glue put on properly?		
3. Does joint fit correctly?		
4. Does joint fit tightly?		
5. Was excess glue removed from joint?		
6. Did student follow safety recommendations?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSBILE = 6

TASK# 215

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Make splined joint

TASK NO: 216

STUDENT WILL: Make splined joint

GIVEN: Two boards to be joined, using a wood spline, tools, and supplies

TOOLS & EQUIPMENT: measuring tools, pencil, wood spline, bench saw, glue, clamps, jack plane or jointer, two boards, and safety glasses

TASK STEPS:

1. Put on safety glasses.
2. Choose a wood spline that is about 1/4 the thickness of each board (See example in textbok pg. 395).
3. Make edges even and straight on boards to be joined. Use a jack plane or jointer.
4. Measure and mark location for wood spline on boards as indicated.
5. Adjust bench saw blade to a little more than 1/2 the width of the wood spline.
6. Adjust rip fence so that cut is made along center of each boards's width.
7. Rip cut both boards.
   CAUTION: Keep hands a safe distance away from cutting blade.
8. Adjust rip fence for cutting the depth of each board as indicated.
9. Cut depth on each board as indicated.
10. Put glue on edges of boards and inside of splined joint made.
11. Place the wood spline into the cut edge of one board and set the other board on it.
12. Tighten joint using clamp and check to make sure joint is straight.
13. Remove excess glue around joint.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at picture of a splined glue joint. See textbook pg. 395.

2. Read all information listed in Task# 216. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 216 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	RATING NO
1. Was splined joint cut along the center of each board?		
2. Was splined joint cut to the proper depth on each board?		
3. Do board edges fit together straight and even?		
4. Do joints fit tightly?		
5. Was excess glue removed from around edges of joint?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 216

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Make a splined miter joint

TASK NO: 217

STUDENT WILL: Join wood using a splined miter joint

GIVEN: Wood to be joined, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil, wood spline, bench saw, miter box, glue, corner clamps, and safety glasses

TASK STEPS:

1. Choose a wood spline that is about 1/4 the thickness of each board (See textbook pg. 393).
2. Make the angle cuts (45) on both boards using a miter box.
3. Adjust the bench saw blade to a 45 angle and to a little more than 1/2 the width of the spline.
4. Crosscut the spline joints using the miter gauge on bench saw as indicated.
5. Put glue on spline and on angle cuts.
6. Fit wood spline into angle cuts on boards then clamp joint together.
7. Remove excess glue from around edges of joint and let dry.

VALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of a splined miter joint. See textbook pg. 393.

2. Read all information listed in Task# 217. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 217 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was angle on each board cut correctly?		
2. Was splined joint cut to correct depth on each board?		
3. Do joints fit tightly?		
4. Was excess glue removed from around edges of joint?		
5. Were board ends even after removing clamps?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 217

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Make a box joint using a bench saw

TASK NO: 218

STUDENT WILL: Make a box joint using a bench saw

GIVEN: Wood to be joined, tools, and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil, bench saw with wood board attached to miter gauge, dado blades, spacer block, and safety glasses

TASK STEPS:

1. Cut boards to proper length and width.
2. Measure and mark edges of boards to be joined as indicated.
3. Attach dado blade to bench saw. Use spacer to keep space between fingers of box joint and equal distance apart.
4. Raise dado blade on saw to thickness of board you are cutting.
5. Screw on spacer block to miter gauge. Make sure spacer is to the right of dado blade and at a distance equal to blade's thickness.
6. Cut the first finger of box joint with board against spacer block.
7. Cut second finger of box joint with first finger joint positioned over space block. Repeat for all finger joints.
8. Cut the other finger joints on second board the same as you did for the first board.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 218-1, in this guide.
2. Look at pictures of box joints. See textbook pgs. 386 and 392.
3. Read all information listed in Task# 218. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
6. Fill-out checklist to see if you have completed Task# 218 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING
1. Were boards cut to correct length and width?	
2. Was spacer block set at proper locations?	
3. Were box joint cuts made at proper depth?	
4. Does box joint fit properly together and not too tightly?	
5. Are surfaces of box joint smooth at all corners?	
6. Are top and bottom edges even at all corners?	

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 218

INFORMATION SHEET 218-1

STUDY WORDS:

waste	- something that is not needed; you can throw it away
spacer block	- a block of wood used to keep the area between each finger of a box joint an equal distance apart
box joint (also called finger joint)	- a joint in which the edges of wood to be joined look like fingers of hands that lock together (see example in textbook pg. 392)

VERBS:

To trim	- to reduce in size, to cut down in size
To position	- to put in place

TASK# 218

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Make a blind mortise to make joint

TASK NO: 219

STUDENT WILL: Cut the tenon and mortise to make joint

GIVEN: Wood to be cut and jointed, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil, combination square, bench saw, drill press, drills stop chisel, hammer glue tenoning jig, bar clamps, and safety glasses

TASK STEPS:

1. Cut wood for making tenon to width indicated.
2. Adjust saw blade height to tenon length.
3. Attach cut piece of wood to tenoning jig and adjust for a cut equal to 1/3 the thickness of the wood.
4. Make two side cuts.
5. Adjust tenoning jig and make two edge cuts.
6. Find and mark the proper length and width of mortise on second piece of wood.
7. Using a drill equal to the width of tenon, drill out the mortise. Use a drill stop for proper depth.
8. Use a hammer and chisel to remove excess wood from inside mortise and to make corners even.
9. Applying glue to the tenon and inside mortise.
10. Push the tenon into mortise and clamp joint.
11. Remove excess glue from around edges of joint.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures and description of mortise and tenon joints. See textbook pgs. 387 and 388.
2. Read all information listed in Task# 219. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 219 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is tenon cut to proper size?		
2. Are all saw cuts straight?		
3. Is mortise cut to proper size?		
4. Are all corners of mortise even?		
5. Does tenon fit mortise properly?		
6. Was excess glue removed from around edge of joint?		
7. Was joint tight and even after removing clamps?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 219

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Sharpen auger bits and twist drill bits

TASK NO: 220

STUDENT WILL: A. Sharpen auger bits
B. Sharpen twist drills

GIVEN: Auger bits and twist drill bits to sharpen, tools and equipment.

TOOLS & EQUIPMENT: auger bits, files, file handle, power grinder, drill point gauge, twist drill bits and piece of wood.

TASK STEPS:

A. 1. Hold auger bit with lead screw against a soft wood block and file the beveled cutting edge from the bottom side only. Use a small, flat needle file. (See Picture of process in textbook pg. 27)
2. Hold auger bit verticlly and file the inside cutting edges of the two spur cutters. Use the small flat needle file.
3. File lead screw only if it has been damaged. File lightly to renew screw threads, Use a small, triangular file (see files in textbook pg.34)
4. Check to see that bit cuts wood evenly and easily.

B. 1. Use a grinding wheel to grind the hard surface of a twist drill bit. Place drill on the side of the grinding wheel.
2. Hold drill at a 51 angle (see picture in textbook pg. 41)
3. Put drill against tool rest start grinding at the cutting edge of lip and rotate drill a half turn. Use light pressure at cutting edge and increase pressure when rotating drill.
4. Grind the second cutting edge of lip in the same way you did for the first cutting edge.
5. Grind the twist drill until both cutting edges of lips are the same length, cool drill bit often in water.
6. Check cutting edges on a drill point gauge and adjust drill until it is the same as angle on gauge.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in the next three tasks on sharpening tools, See Information Sheet pg. 220-1.

2. See pictures of tools and processes you will use to do this task. See textbook pgs. 27 and 41.

3. Read all information listed in Task# 220. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

6. Fill-out checklist to see if you have completed Task# 220 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Was beveled cutting edge of auger filed correctly?		
2. Were inside cutting edges of spur cutters filed correctly?		
3. Does auger bit cut wood evenly and easily?		
B. 1. Did student grind cutting edges of twist drill to a 59 angle?		
2. Are both cutting edges of lips the same length?		
3. Was drill cooled frequently in water?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-3
TOTAL POINTS POSSIBLE = A-3 B-3

TASK# 220

INFORMATION SHEET 220-1

STUDY WORDS:

flat side	- a surface that is smooth and level

VERBS:

To clamp	- to attach something by using a clamp (see textbook pg. 36)
To hone	- to make sharp using a honing tool (see textbook pg. 33)
To grind	- to make sharp and smooth using a power grinder (see textbook pg. 41
To flatten	- to make something level with a surface
To straighten	- to make straight
To match	- to be equal, to be the same
To skip	- to leave alone, not touch

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Sharpen wood chisels and plane blade

TASK NO: 221

STUDENT WILL: A. Sharpen wood chisels
B. Sharpen plane blade

GIVEN: Tools to be sharpened, supplies and equipment.

TOOLS & EQUIPMENT: wood chisels, plane blade, powered grind stone, honing jig, light machine oil, whetstone, a piece of paper and safety glasses

TASK STEPS:

A. 1. Straighten the cutting edge on a powered grindstone (see textbook pg. 31)
2. Set the adjustable rest on grinder at a 25 angle and grind the chisel along its complete width. Cool the chisel often in water.
3. Attach the chisel in a honing jig, which is set for a 30 angle. (see picture in textbook pg. 31)
4. Move chisel back and forth across oiled honing stone. Stop when a 1/8 inch secondary bevel is made (see picture in textbook pg. 40)
5. Remove the chisel from the honing jig. Lay it flat on the whetstone and move chisel back and forth to remove the burr on the float side of chisel (see picture in textbook pg. 33)

B. 1. Sharpen plane blade in the same way you sharpened the chisel. Follow steps 1 through 5 above.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-*Complete Do-it-Yourself Manual*

LEARNING ACTIVITIES

1. See pictures of tools and process, you will use to do this task. See textbook pgs. 31, 33, and 40.

2. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competency Sheet in this guide.

3. Ask teacher to demonstrate part "A" of this task. See teacher.

4. Repeat what the teacher did. See Competency Sheeet and follow instructions in "TASK STEPS". (part "A" only)

5. Now read all information listed fro part "B" of Task# 221. See Competency Sheet in this guide.
   NOTE: "TASK STEPS" for parts "A" and "B" are the same.

6. Ask teacher to demonstrate part "B" of this task. See teacher.

7. Competency Sheet and follow instructions in "TASK STEPS".

8. Fill-out checklist to see if you have completed Task# 221 correctly. See Student Evaluation Checklist in this guide.

9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
A. 1. Is chisel edge straight with no nicks on it?		
2. Was all cutting edges sharpened at a 25 angle?		
3. Was an 1/8 inch secondary bevel made?		
4. Was chisel often cooled in water?		
5. Does chisel cut paper easily?		
B. 1. Is plane blade straight and flat?		
2. Was blade sharpened at a 25 angle?		
3. Was an 1/8 inch secondary bevel made?		
4. Was plane blade often cooled in water?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-5 B-4
TOTAL POINTS POSSIBLE = A-5 B-4

TASK# 221

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Sharpen hand saws

TASK NO: 222

STUDENT WILL: Sharpen crosscut and rip hand saws

GIVEN: Saws to be sharpened, tools and equipment.

TOOLS & EQUIPMENT: clamps, saw set, cross cut saw, rip saw, two boards, bench vise, files, and safety glasses

TASK STEPS:

1. Clamp the hand saw between two boards in bench vise. Keep saw teeth 1/4 inch above the boards (see picture in textbook pg. 20).
2. Hold the file at an angle that matches the angle of saw teeth, (60 for a crosscut saw and 90 for a rip saw).

[illegible]. Move file lightly over each saw tooth one or two times.
NOTE: On crosscut saw, do one tooth then skip a tooth. Continue this way along complete length of saw teeth that you skipped before. On rip saw, file each saw tooth from the same side.

4. Adjust saw set tool to number of saw teeth (see picture in textbook pg. 20).
5. Using saw set, bend one tooth then skip a tooth. Continue this way along complete length of saw teeth.
6. Turn the saw around in vise and bend in the opposite direction the saw teeth that you skipped before.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See picture of tools and processes you will use to do this. See textbook pg. 20.
2. Read all information listed in Task# 222. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 222 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were crosscut teeth filed at a 60 angle?		
2. Were rip saw teeth filed at a 90 angle?		
3. Are all teeth on crosscut saw the same size?		
4. Do all teeth on rip saw bend an equal amount?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 222

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Install plywood sheathing on outside of building

TASK NO: 223

STUDENT WILL: Put up plywood sheating on outside framed wall.

GIVEN: Outside wall to cover with sheathing, tools, and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil, hand or portable power saw, large square, hammer, nails, plywood

TASK STEPS:

1. Measure from outside corner of framed wall to last stud within length of plywood sheathing.
   NOTE: Each sheathing board is 4 feet wide by 8 feet long. The length of the sheathing is going to be placed on wall horizontally.
2. Mark sheathing length so it meets at the center of a stud.
3. Cut sheathing along this mark.
4. Position first piece of sheathing flush with corner stud and flush to bottom of header (see textbook pg. 377).
5. Nail the sheathing into studs. Use 6 or 8 penny common nails and hammer them in about 6 inches a part (see text book pg. 68 and 69).
6. Cut second row of sheathing to allow for staggered joints.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 223-1 in this task.

2. Read all information listed in Task# 223. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 223 correctly. See Student Evaluation Checklist to in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Do sheathing joints meet at center of studs?		
2. Are joints on second row staggered?		
3. Did student use the proper size nails?		
4. Did student space the nails correctly?		
5. Was sheathing nailed on all studs?		
6. Was sheathing positioned on wall correctly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 223

INFORMATION SHEET 223-1

STUDY WORDS:

studs	- vertical boards that are usually 2 inches thick by 4 inches wide; They are placed for support in outside walls of buildings then sheathing is nailed to them
framed wall	- a basic wall construction made with studs. (see textbook pg. 377)
centered	- placed in the middle of same thing
staggered sheathing joints	- sheathing joints in one row that do not meet in line with joints in rows above or below

VERBS:

To be flush	- to be even, straight against something
To allow	- to permit
To space	- to place an exact distance apart

TASK# 223

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JON TASK: Install wallboard, tape joints, and cover nails

TASK NO: 224

STUDENT WILL:
A. Install wallboard (also called drywall)
B. Tape joints and cover nail heads

GIVEN: An inside wall that needs to be covered, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, pencil, large square, wallboard, trimming knife, hand saw, hammer, dry wall nails, drywall putty knives, corner tool, joint tape, joint compound, wallboard, metal edging for outside corner, and safety glasses

TASK STEPS:

A. 1. Lay wallboard on sawhorses, (see sawhorses in textbook pg. 340)
   2. Measure and cut wallboard to length indicated. Keep joints at center of studs.
   3. Measure and cut out openings for any windows or doors.
   4. Position wallboard on wall and nail to studs. Use drywall nails and space nails about 7 inches apart.
      NOTE: wallboard can be installed vertically or horizontally.

B. 1. Set all drywall nails in a little below the surface of the wallboard.
   2. Apply joint compound to completely fill joints, cover nail heads and edges of wallboard panels.
   3. Apply joint tape, and put more joint compound over tape. Use a wide putty knife to make compound smooth and even over surface.
   4. For inside corner, fold (bend) along the center of drywall tape and apply compound to inside corners. Apply more compound and use an inside corner tool to smooth the tape (see pictures in textbook pg. 97).
   5. Nail the metal edging to outside corner and apply compound with wide drywall putty knife.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See pictures of tools and processes you will use to do this task. See textbook pgs. 93 to 97.

2. Read all information listed in Task# 224. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 224 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
A. 1. Are all wallboard joints at center of studs?		
2. Were the right kind of nails used?		
3. Were nails set and spaced correctly?		
B. 1. Are all taped joints completely covered with joint compound?		
2. Are all nail heads covered with joint compound?		
3. Is inside corner joint evenly covered with joint compound?		
4. Is inside corner joint smooth and straight?		
5. Is outside corner edging evenly covered with joint compound?		
6. Is outside edging on straight?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-3 B-6
TOTAL POINTS POSSIBLE = A-3 B-6

TASK# 224

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Sand and finish wallboard taped joints

TASK NO: 225

STUDENT WILL: Sand and finish and apply primer paint to wall board taped joints

GIVEN: Wallboard with taped joints, supplies and equipment.

TOOLS & EQUIPMENT: hand sander, medium grade sandpaper, wide putty knife, drywall compound, primer, paint brush, and rag

TASK STEPS:

1. Lightly sand surfaces of taped joints and any nailheads with a medium sandpaper to make all the area smooth and even.
2. Wipe off surfaces with a rag and check to see that area is flat and smooth.
3. If necessary, continue sanding an area that is not smooth and even.
   NOTE: Do not sand into the tape only over surface of drywall compound.
4. Examine wall area again and apply more compound to surfaces that are not even.
5. Permit surfaces to dry completely.
6. Sand again and apply a primer or sealer paint over surfaces.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. See pictures of tools and process that you will use to do this task. See textbook pg. 96.

2. Read all information listed in Task# 225. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 225 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was sanding done over areas cpvered by drywall compound and not into the tape?		
2. Did taped joints look smooth and even after sanding?		
3. Was primer or sealer paint put on these surfaces?		
4. Do these surfaces look even after application of primer or sealer paint?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 225

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Rough-in (cut to make) windows and door openings

TASK NO: 226

STUDENT WILL:
A. Cut and frame an opening for a window
B. A finished outside wall

GIVEN:
A. A finished outside wall
B. A finished inside and outside wall

TOOLS & EQUIPMENT: measuring tools, pencil, protable power drill, drill bits, hand saw, nails, 2x4 and 2x8 pieces of wood (studs)

TASK STEPS:

A. 1. Locate window opening. Because most windows are on outside walls, it is necessay to use 2x8 studs for header. (see textbook pg. 127).
   2. Cut window opening 1/2 inch longer and wider than actual size of window.
   3. Cut out all wall studs inside of window opening.
   4. Install two 2x4 studs for the rough window sill, (see picture in textbook pg. 127).
   5. Stand two 2x8 studs on their sides and install them for header.
   6. Nail supporting 2x4 jack studs at sides of window opening.

B. 1. Locate door opening. If opening is going to be made on a wall that carries the weight of the house (a load bearing wall), then choose two 2x8 studs for the header, (see textbook pg. 148).
   2. Cut opening for door 4 inches wider and higher than actual size of door.
   3. Cut out all studs in door opening.
   4. Stand two 2x8 studs on their sides and install for the header.
   5. Nail supporting jack studs at sides of door opening.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-*Complete Do-it-Yourself Manual*

LEARNING ACTIVITIESS

1. See standard sizes of lumber (wood) used for building construction. See textbook pg. 373.

2. See pictures of tools and processes you will use to do this task. See textbook pg. 127 and 148.

3. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competency Sheet in this guide.

4. Ask teacaher to demonstrate this part of Task# 226. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS" (part a only).

6. Now read all information listed in part "B" of this task. See Competency Sheet.

7. Repeat step numbers 4 and 5 of this paper. Do part "B" only.

8. Fill-out checklist to see if you have completed Task# 226 correctly. See Student Evaluation Checklist in this guide.

9. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

	ITEMS TO BE CHECKED	RATING	
		YES	NO
A. 1.	Were 2x8 studs installed correctly for window header?		
2.	Were 2x4 jack studs installed correctly to support header?		
3.	Were 2x4 studs installed correctly for window sill?		
4.	Is opening for window the correct size?		
B. 1.	Were 2x8 studs installed correctly for door header?		
2.	Were jack studs installed correctly to support header?		
3.	Is opening for door the correct size?		
4.	Are all studs firmly nailed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-4 B-4
TOTAL POINTS POSSIBLE = A-4 B-4

TASK# 226

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Install inside and outside window

TASK NO: 227

STUDENT WILL: Install inside and outside window trim

GIVEN: An installed window, tools and supplies

TOOLS & EQUIPMENT: measuring tools, pencil, hammer, nails, miter box, inside and outside window trim, wood drip cap, and flashing, nail set

TASK STEPS:

1. Using miter box, cut the outside top and side trim pieces. Trim should overlap window frame so that trim is 1/2 inch longer at sides and tip of window frame.
2. Using 6 or 8 penny finished nails, nail the trim in place. Make sure miter joints fit tightly.
3. Install drip cap and flashing over top trim.
4. Using miter box, cut inside top, bottom, and side trim pieces. Trim should overlap window frame 1/2 inch all around.
5. Using 6 penny finished nails, nail the trim in place. Make sure joints fit tightly.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures on parts of window frame. See textbook pgs. 127, 398, and 399.
2. Read new words that will be presented in this task. See Information Sheet pg. 227-1 in this guide.
3. Read all information listed in Task# 227. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
6. Fill-out checklist to see if you have completed Task# 227 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Do outside miter joints on trim fit tightly?		
2. Does side trim fit window sill tightly?		
3. Do drip cap and flashing fit tightly?		
4. Do inside miter joints on trim fit tightly?		
5. Was trim installed evenly around window frame?		
6. Was all trim nailed firmly around window frame?		
7. Does trim cover all openings around window?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 227

INFORMATION SHEET 227-1

STUDY WORDS:

trim	- wood molding used around all sides of window
top	- the highest part on a window frame
bottom	- the lowest part on a window frame
sil	- a horizontal piece of wood made across the bottom of the opening into which a window is set (see textbook pg. 118)

VERBS:

To extend	- to make larger
To overlap	- to extend trim over window frame so that trim is longer and wider than window frame

TASK# 227

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Install door jambs and hang door

TASK NO: 228

STUDENT WILL: A. Install door jambs
B. Hang door

GIVEN: A roughed in door opening, tools and equipment.

TOOLS & EQUIPMENT: measuring tools, pencil, hammer, long level, shingle shim stock, nails portable drill, wood boring bits, chisels, screwdriver, screws, plane portable circular saw, door jambs, thresholdd door stop, trim, and door hardware

TASK STEPS:

A. 1. Cut door jambs to door opening height and width. (see textbook pg. 148)
   2. Nail the top jamb to side jambs.
   3. Using shim, nail one side of jamb at the bottom. Make sure jamb is flash to both inside and outside walls.
   4. Using long level, plumb the side jamb in both directions, then shim and nail the top of side jamb.
   5. Using shims, straighten and nail side jamb at two other positions about 16 inches apart.
   6. Shim and nail the bottom of other side jamb for proper width.
   7. Plumb side jamb in both directions, then shim and nail in position.
   8. Cut and nail down threshold as indicated.
   9. Trim off shims so they are even with door jambs.

B. 1. Cut off any door stile extensions. (see textbook pg. 141)
   2. Cut door to correct width and height. Permit 1/8 inch clearance at sides and 1/4 icnh clearance for door height.
   3. Plane cut edges smooth. Plane a light bevel on latch side of door.

CONTINUED ON NEXT PAGE

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAIANTENANCE PROGRAM

CONTINUED

TASK NO: 228

TASK STEPS:

B. 4. Notch out door edge for butt hinges and install hinges.
5. Position door in opening. Shim bottom of door for clearance.
6. Mark position of hinges on door jamb with pencil.
7. Chisel out hinge notches on door jamb.
8. Remove pins from butt hinges and screw other half of each hinge to door jamb. (see textbook pg. 140)
9. Hang door by putting pints in hinges again.
10. Install door knob and strike plate as indicated on package of product.
11. Position the door even with inside jamb.
12. Miter cut and nail door stop in position.
13. Test door for good closing action.

EVALUAITON: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of door and equipment you use to do this task. See Textbook pgs. 80, 81, 141, and 148.

2. Read new words that will be presented in this task. See Information Sheet pg. 228-1, in this guide.

3. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only. See Competebcy Sheet in this guide.

4. Ask teacher to demonstrate this part of Task# 228. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS," (part "A" only).

6. Now read all information listed in part "B" of Task# 228. See Competency Sheet.

7. Repeat step numbers 4 and 5 on this paper. Do part "B" only.

8. Fill-out Checklist to see if you have completed Task# 228 correctly. See Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

	ITEMS TO BE CHECKED	RATING	
		YES	NO
A. 1.	Are door jambs vertical and straight?		
2.	Are door jambs level and even with inside and outside wall?		
3.	Are door jambs the correct width?		
4.	Were shims nailed tightly?		
5.	Were shims trimmed even with jambs?		
B. 1.	Was door cut to correct length and width?		
2.	Is clearance space even all around jamb?		
3.	Were door knob and strike plate installed correctly?		
4.	Does door knob turn easily?		
5.	Was door stop installed correctly?		
6.	Does door open and close easily?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-6 B-6
TOTAL POINTS POSSIBLE = A-6 B-6

TASK# 228

INFORMATION SHEET 228-1

STUDY WORDS:

roughly	- the open area between sides of door and door frame, or between bottom of door and threshold
wedge or shim	- a piece of hardwood that is thick at one end and thin at the other end. It can be forced under or between things to raise or level them
door hardware	- metal parts you attach to door example: door knob strike plate, etc.

VERBS:

To shim	- to raise or level something using a shim or wedge
To plumb	- to measure something to find out if it is perfectly vertical or straight
To trim off	- to cut off
To hang door	- to attach door to one side of door frame using hinges
To notch out	- to make a curved or v-shaped cut into edge of door
To rough-in	- to make or cut roughly

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Replace outside and inside door trim (molding)

TASK NO: 229

STUDENT WILL: A. Replace outside door trim
B. Replace inside door trim

GIVEN: An exterior door with damaged trim that needs replacing, tools and equipment.

TOOLS & EQUIPMENT: measuring tools, pencil, combination square, bevel, putty, putty knife, hammer, nails, nail set, pry bar, chisel, trim and miter box

TASK STEPS:

A. 1. Remove old trim. Be careful not to damage door, door jamb, or siding (outside wall).
2. Using a bevel, measure angle where trim meets the door threshold or saddle, (see textbook pg. 149). Mark trim and cut at this angle.
3. Position side trim pieces 1/4 inch from inside above head jamb, (see textbook pg. 148)
4. Cut both side trim pieces in miter at a 45 angle from length marks, (see textbook pg. 399).
5. Measure top trim piece 1/2 inch longer than inside of door jamb. Cut both ends of piece in miter box at a 45 angle.
6. Put in position and lightly attach both side trim pieces with nails.
7. Put in position and nail in the top trim piece using 8 penny finish nails.
8. Adjust side trim pieces so they are vertically even along area of door jamb and wall.
9. Nail the outside corners of trim together using 4 or 6 penny nails. Hammer mail heads into surface of wood then cover nail holes with putty.

CONTINUED ON NEXT PAGE

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENACE PROGRAM

CONTINUED

TASK NO: 229

TASK STEPS:

B. 1. Remove old trim be creful not to damage door, door jamb or inside wall.
2. Cut bottom of each side trim piece straight and even.
3. Position side trim pieces 1/4 inch above head jamb on each piece of trim.
4. Cut each side trim piece in miter box at a 45 angle from length mark.
5. Measure and cut top trim piece 1/2 inch longer than inside of door jamb.
6. Position the side trim pieces 1/4 inch from jamb edge and lightly nail side pieces.
7. Position the top trim piece and firmly nail in using 6 penny nails.
8. Adjust side trim pieces so they are vertically even along area of door jamb and nail side pieces using 6 penny nails. Be sure to nail them into the jamb and wall.
9. Nail the outside corners of trim together using 4 penny finish nails. Hammer the nail heads into surface of wood then cover nail holes with putty.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures on door trim (also called molding or casing), and on process you will use to do this task. See your textbook pgs, 141, 144, 148-149.

2. This task is in two parts. The parts are marked "A" and "B". Read all information listed in part "A" only See Competency Sheet in this guide.

3. Ask teacher to demonstrate this part of Task# 229. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS", (part "A: only).

5. Now read all information listed in part "B" of this task. See Competency Sheet.

6. Repeat step numbers 3 and 4 on this paper. Do part "B" only.

7. Fill-out checklist to see if you have completed Task# 229 correctly. See Student Evaluation Checklist in this guide.

8. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
A. 1. Was old trim removed carefully with no damage to door, door jamb or outside wall?		
2. Do bevel joint fit tightly?		
3. Is space along door jambs even?		
4. Does putty cover all nail holes?		
B. 1. Was old trim removed carefully with no damage to door, door jamb or inside wall?		
2. Do miter joints fit tightly?		
3. Is space along door jambs even?		
4. Does putty cover all nail holes?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = A-4 B-4
TOTAL POINTS POSSIBLE = A-4 B-4

TASK# 229

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Replace baseboard and shoe molding

TASK NO: 230

STUDENT WILL: Replace baseboard and shoe molding

GIVEN: A wall with a damaged baseboard and shoe molding.

TOOLS & EQUIPMENT: measuring tools, pencil, hammer, nails, miter box, pry bar or chisel, putty knife, stud finder, baseboard and shoe molding

TASK STEPS:

1. Remove damaged baseboard and shoe molding. Try to save as much of old baseboard as possible to use again. Be careful not to damage wall.
2. Locate wall stud closest to area of baseboard that was removed. Use a stud finder.
3. Using the undamaged part of old baseboard, cut baseboard at a 45 angle and nail to wall stud that you located using 6 penny finish nails.
4. Cut a section of new baseboard to fill in damaged section. Cut end of new section that meets old section at a 45 angle in opposite direction of angle cut before.
5. Position the 45 angle joint in place and nail joint together over wall stud using 6 penny finish nails.
6. Hammer all nail heads so they go down into the surface of the wood a little bit. This is called "setting the nails".
7. Cover all nail holes with putty.
8. Cut and replace shoe molding in the same way that you did for baseboard.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of baseboard, shoe molding, and process you will use to do this task. See your textbook pg. 102 and 103.

2. Read all information listed in Task# 230. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 230 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was wall left in good condition with no damage?		
2. Are baseboard and shoe molding joints even?		
3. Are baseboard and shoe molding joints nailed over a stud?		
4. Is molding nailed tightly to wall?		
5. Are all nail heads hammered into surface of wood?		
6, Does putty cover all nail holes?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 230

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Patch a hole in a floor

TASK NO: 231

STUDENT WILL: Patch a hole in a floor by cementing a square piece of wood over hole

GIVEN: A tiled floor with a hole that passes through both the tile and finished floors.

TOOLS & EQUIPMENT: measuring tools, pencil, chisels, hammer, floor tile, glue, piece for floor tile nails, floor patch cement, wood, trowel, sharp, knife, hand saw, sandpaper, rag, and gallon paint can

TASK STEPS:

1. Cut a square piece of wood so that it is the same thickness of finished floor and at least two inches bigger than the hole.
2. Lay the center of square wood patch over the hold in floor and outline the edges of wood using a pencil.
3. Remove wood and chisel straight down along the pencil outline you made. Chisel through tile and finished floor. Do not cut into sub floor.
4. Remove all loose material around the hole and check to see that the wood patch fits flush to the finished floor.
5. Remove wood patch and apply wood glue around the edges of the hole.
6. Nail the wood patch down over the sub floor.
7. Fill in all spaces along the edges of the wood patch with floor patch cement.
8. When cement is dry, sand the wood patch area.
9. Apply floor tile glue to the back of a square piece
10. Wipe surface of tile with rag and set heavy weight over tile, (see textbook pg. 117).

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet 231-1, in this guide.
2. Look at pictures of a tiled floor with a hole in it. See textbook pg. 117.
3. Read all information listed in task# 231. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
6. Fill-out Checklist to see if you have completed Task# 231 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is wood patch the same thickness as finished floor?		
2. Were all spaces along edges of wood patch filled with floor patch cement?		
3. Was piece of tile glued correctly to wood patch?		
4. Was heavy weight placed over glued tile?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 231

INFORMATION SHEET 231-1

STUDY WORDS:

at least	- at the very lowest amount; with no less than
flooring	- a kind of material used to make a floor
floor covering	- the material that covers the surface of a floor example: carpet, tile, etc.
finished floor	- the flooring under a tiled or carpeted floor
sub-floor	- the flooring under the finished floor

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Repair siding on building

TASK NO: 232

STUDENT WILL: Remove damaged section of siding and replace with new siding

GIVEN: An outside wall with damaged or rotted siding, tools and supplies.

TOOLS & EQUIPMENT: measuring tools, hamamer, nails, pry bar, wood wedges, chisel, backsaw, hacksaw, new siding that matches old siding , ladder or scaffold, and putty

TASK STEPS:

1. Find closest wall stud next to damaged area and cut damaged siding aloug wall stud.
2. Remove nails if possible or cut them out using a hacksaw, (see textbook pg. 180).
3. Chisel out damaged siding along the bottom edge of section above it.
4. Pry up section of siding above damaged area using a pry bar or wood wedges. Remove or cut nails in this section.
5. Cut new siding to correct length and position new siding. Make sure each siding joint is over a wall stud.
6. Hammer in the siding under the section above it. Use a wood block between hammer and edge of siding to prevent damage to siding edges when hammering. Make sure siding edges are flush and straight.
7. After hammering in new siding, nail down the new siding and siding and section above it.
8. Set in the nails and fill nail holes with putty.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet pg. 232-1, in this guide.

2. See pictures on process for repairing siding (clapboard). See textbook pg. 180.

3. Read all information listed in Task# 232. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Fill-out checklist to see if you have completed Task# 232 correctly. See Student Evaluation Checklist in this guide.

7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is siding next to repaired section in good condition with no damage?		
2. Are siding edges flush and straight?		
3. Are siding joints placed over wall studs?		
4. Is siding nailed tightly?		
5. Are nail holes filled with putty?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 232

INFORMATION SHEET 232·1

STUDY WORDS:

ground	- the grass, dirt, or other hard surface that is around the outside of building
rotted wood	- wood that is falling apart; in destruction
siding, clapboard	- a narrow board usually thicker at on edge than at the other edge. It is used to cover the surface of outside walls.
scaffold	- a temporary floor that workers stand or sit on when working at a height above the ground, (see textbook pg. 325)
removal	- the process of removing something from a place

VERBS:

To pry	- to raise one part of a section of board and then the other part using a pry bar or wood wedge
To prevent	- to make impossible

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Repair a small hole in wallboard

TASK NO: 233

STUDENT WILL: Repair a small hole in wallboard using wallboard compound

GIVEN: A wall with a small hole, tools and supplies.

TOOLS & EQUIPMENT: pencil, small piece of wallboard, trimming knife, wallboard compound, keyhole saw, wide putty knife, trowel, wood screw and sandpaper

TASK STEPS:

1. Cut a patch of wallboard larger than hole.
2. Position the patch over the hole and outline patch using pencil.
3. Remove patch and cut along outline marks on wall using a trimming knife or key hole saw, (see textbook pg. 94).
4. Attach a screw to the center of patch to permit you to use screw as a handle for patch.
5. Apply wallboard compound around the edges of the cut hole and wallboard patch, (see textbook pg. 97)
6. Holding screw on wallboard patch, position the patch in hole so that patch is even with wall area around it.
7. Remove excess wallboard compound from the joint edges of patch and let area dry.
8. Remove the screw from patch and apply more compound over all of patch area using a trowel. Let area dry.
9. Using sandpaper, sand all patched area until it is smooth and even with the rest of wall.

EVALUATION: Student Evaluaiton Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITES

1. See pictures of tools and process you will use to do this task. See your textbook pgs. 94 and 97.

2. Read all information listed in Task# 233. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacaher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 233 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was patched area dry before putting on more wallboard compound?		
2. When dry, was patched are sanded?		
3. Is patched area smooth and even with rest of wall?		

TOTAL POINTS EARNED

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 233

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Repair large hole in wallboard

TASK NO: 234

STUDENT WILL: Repair a large hole in wallboard by cementing a wallboard patch over plywood

GIVEN: A wallboard with a large hole in it, tools and supplies

TOOLS & EQUIPMENT: pencil, square piece of wallboard wallboard joint compound, adhesive (glue) trimming knife, key hold saw, wide putty knife, trowel, 3/4 or 3/8 inch piece of plywood, hand drill screws, screwdriver, and sandpaper

TASK STEPS:

1. Cut a square piece of wallboard a little larger than the hole.
2. Position the wallboard patch over the hole and outline patch using a pencil.
3. Using a trimming knife or keyhole saw, cut an opening along pencil marks of patch outline.
4. Cut a piece of plywood, for backup plate, about 2 inches larger than the cut hole.
5. Cut a 3/4 inch hole in the center of the plywood.
6. Apply adhesive to the edges of the plywood, and place into and against back of wallboard. (see textbook pg. 98)
7. Put adhesive into small center hole in plywood to hold it tight against back of wallboard and screw plywood to wall board.

   Apply wallboard joint compound along edges of hole and at center of plywood.

9. Position the square over plywood so that it is flush with the rest of wall.
10. Apply joint compound to fill the spaces around the patch and to cover the surface of the patch. Use a wide putty knife.
11. Permit joint compound to dry then sand and apply more compound in the same way as before.
12. Let surface dry again then sand all surface smooth and even with rest of wall.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself-Manaul

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See your textbook pg. 98.

2. Read all information listed in Task# 234. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 234 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was joint compound completely dry before sanding?		
2. Was all damage to wall repaired?		
3. Is patched area smooth and even with rest of wall?		

TOTAL POINTS EARNED =

POINTS NEEDED OF MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK# 234

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Replace damaged floor tile

TASK NO: 235

STUDENT WILL: Replace damaged floor with new tile

GIVEN: A floor with a damaged floor tile, tools and supplies

TOOLS & EQUIPMENT: propane torch, putty knife, wood chisel, hammer, new floor tile, tile adhesive, trowel with small notches cut into it, solvent cleaner, and clean rags

TASK STEPS:

1. Heat the damaged tile using a propane torch; (see textbook pg. 116). Apply just enough heat at center of tile to make adhesive glue underneath tile soft. Be careful not to burn other tiles near the area.
2. Carefully pry up the damaged tile with a putty knife or chisel out the tile with a wood chisel.
3. Remove all old adhesive from floor area under old tile.
4. Spread a thin coat of tile adhesive on floor area.
5. Lightly heat new tile until it bends easily. Put tile in place. Make sure tile matches floor pattern.
6. Press tile down on the floor.
7. Press edges of tile until they are even with other tiles around it. It may be necessary to hit edges of tile lightly with a hammer to make edges even with other files.
8. Remove any adhesive from surface area of tile. Use the solvent recommended on the can of adhesive and then dry surface with clean rags.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See your textbok pgs. 116 and 352.

2. Read all information listed in this task. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 235 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is color of tile the same as rest of floor?		
2. Does the direction of pattern lines or design match the rest of floor?		
3. Is new tile even along the edges?		
4. Was adhesive removed from all surface of tile?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 235

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Replace ceramic tile on floor

TASK NO: 236

STUDENT WILL: Replace a damaged ceramic tile on floor

GIVEN: A floor with a damaged ceramic tile.

TOOLS & EQUIPMENT: measuring tools, pencil, notched trowel small-area trowel, glass cutter, tile nippers, tile cutter, hacksaw blade, tile adhesive, sponge, grout, grout spacers, hammer, chisel, rubber-surfaced trowel, rags, and tooth brush

TASK STEPS:

1. Remove broken tile, old adhesive and grout (cementing material used between tiles). Use hammer and chisel.
2. Cut and fit new tile to area where old tile was removed Leave a space equal to width of grout.
3. Apply adhesive to back of new tile using the notched trowel that is recommended on the can of adhesive.
4. Press tile firmly in place and put grout spacers between tile edges, (see textbook pg. 357). Continue to press down the tile until it is even with rest of tile on floor.
5. Let adhesive dry for 24 hours.
6. Remove grout spacers and completely fill spaces between tile with gourt using a rubber-surfaced trowel.
7. Remove excess grout from tile surface using a damp sponge or rag.
8. Make grout joints smooth using the handle of a toothbrush.
9. When dry, wipe all surface with a dry rag.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See pgs. 154 and 352 to 357.
2. Read all information listed in Task# 236. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 236 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are all grout joints the same in width?		
2. Are all grout joints completely filled with grout?		
3. Was excess grout removed from tile surface?		
4. Is new tile even with rest of tile on floor?		
5. Is new tile in good condition with no breaks?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 236

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Replace a broken window and reglaze it

TASK NO: 237

STUDENT WILL: Replace a broken window and reglaze using glazing compound

GIVEN: A broken window, tools and supplies

TOOLS & EQUIPMENT: propane torch, wood chisel, putty knife, pliers, glazing points, glazing compound, fast drying sealer paint, hammer, paint brush and sandpaper

TASK STEPS:

1. Remove old putty from window frame using a wood chisel, putty can be made soft by heating it with a propane torch.
2. Remove all old glazier's points and remove broken glass using pliers.
3. Clean out all putty from groove with putty knife or sandpaper.
4. Put a coat of fast drying sealer paint in groove.
5. Apply a thin bed of glazing compound to groove and press glass in window groove, (see textbook pg. 123)
6. Tap glazier's points every 6 to 8 inches along glass and into window sash. Make sure glazier's points are in securely.
7. Roll glazing compound into a rope about 3/8 of an inch in diameter and press along the edge of the glass. Make sure glazier's points are covered by compound.
8. Using a putty knife, smooth the glazing compound at an angle to the glass forming a neat triangular bead, (see textbook pg. 123).
9. Permit glazing compound to dry two or three days and then paint being sure to overlap glass about 1/16 of an inch.

EVALUATION: Student Evaluation Checklist. Make score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See your textbook pgs. 123 and 124.

2. Read new words that will be presented in this task. See Information Shet 237-1, in this guide.

3. Read all information listed in Task# 237. See Competency Sheet in this guide.

4. Ask teacher go demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

6. Fill-out checklist to see if you have completed Task# 237 correctly. See Student Evaluation Checklist in this guide.

7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Was new glass put in without breaking it?		
2. Were glazier's points put in tightly?		
3. Does glazing compound completely cover all glazier's points?		
4. Does glazing compound completely cover all glazier's points?		
5. Does window have a neat bead of glazing compound?		
6. Was 1/16 of an inch along bottom edge of glass covered with sealer paint?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 237

INFORMATION SHEET 237-1

STUDY WORDS:

rope	- a long cord made from glazing compound
neat bead	- a straight thick line
glaze	- to apply a glazing compound or to cover an area with glass
glazier's points	- small pieces of material used between window and frame to hold glass in place
grooves	- long narrow track or depression
securely	- safely or tightly

VERBS:

To tap	- to hit lightly
To overlap	- to extend over glass and cover a part of it
To secure	- to attach or make tight

COMETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Caulk windows and doors

TASK NO: 238

STUDENT WILL: caulk and seal joints on windows and doors using caulking, (a substance that keeps water and wind from getting into building through joints where windows and doors meet wall)

GIVEN: Windows and doors with joints that need sealing, tools and supplies.

TOOLS & EQUIPMENT: wirebrush, putty knife, caulking, caulking gun, hammer, nails, oakum, wood chisel, sandpaper

TASK STEPS:

1. Brush all loose material from the joint to be caulked using wire brush. Remove old caulking and wipe with a rag covered with solvent .
   NOTE: Caulk only when the outside temperature is above 60 degrees.
2. Choose a good quality caulking that is proper for the material you are going to seal.
3. Load (put into) the caulking gun with a tube of caulking. Cut off the end of the tube nozzle at a 45 angle then break seal inside nozzle using a long nail, (see textbook pg. 182).
4. Hold caulking gun at a 45 angle. Apply pressure to trigger (moving part on handle of gun), and move nozzle along both sides of joint to be sealed.
5. Work at a speed that permits you to completely fill joint with caulking.
6. Smooth any uneven caulking using a rag covered with solvent.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See your textbook pg. 182.
2. Read all information listed in Task# 238. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 238 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	RATING NO
1. Was all loose material cleaned from joints before caulking them?		
2. Was old caulking cleaned from joints?		
3. Was caulking cleaned from joints?		
4. Does caulking put on evenly?		
5. Is surface of each joint smooth with no uneven caulking?		
6. Was the proper kind of caulking used for windows and doors?		
7. When caulking joints, was outside temperature 60 degrees or above?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 238

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Carpentry Related Duties

JOB TASK: Replace damaged asphalt roof shingles

TASK NO: 239

STUDENT WILL: Replace damaged asphalt roof shingles

GIVEN: A roof with damaged shingles, tools and supplies

TOOLS & EQUIPMENT: trimming knife, pry bar, hammer, roofing nails, chisel, roof cement, putty knife, matching asphalt roof shingles, and ladder

TASK STEPS:

1. Collect all tools and materials needed.
2. Place ladder against edge of roof. Be sure it is on solid ground and at a proper angle. The bottom of ladder should be placed at a distance from building equal to 1/4 of the ladder's length.
3. Move all tools and materials to roof. Wear shoes that have soft bottoms when working on roof.
4. Raise the shingle immediately above the damaged on and remove the roofing nails from damaged shingles using a pry bar or chisel. Be careful not to damage the raised shingle.
5. Pull out the damaged shingle and put a new shingle in its place.
6. Nail the new shingle down using 7 nails for each shingle. Make sure nails are place in an area on shingle where they will be covered by shingle above it.
7. Put a little roofing cement under shingles to hold down the corner of shingles in work area.
8. Remove all old roof shingles and throw away in proper place.
9. Clean and put all tools away in proper storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures oif tools and process you will use to do this task. See your textbook pg. 166.

2. Read all information listed in Task# 239. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 239 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Are all shingles in work area in good condition?		
2. Were all roofing nails removed from damaged shingles?		
3. Were correct roofing nails used on new shingles?		
4. Does shingle above each replaced shingle cover all nail heads?		
5. Are corners of shingles in work area cemented down?		
6. Were all old shingles removed from roof?		
7. Were all tools cleaned and put away in the proper storage area?		

TOTAL POINTS EARNED -

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 239

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Remove a section of damaged sidewalk

TASK NO: 300

STUDENT WILL: Remove a section of damage sidewalk and construct forms along both sides of removed sidewalk

GIVEN: A damaged section of sidewalk, tools and equipment.

TOOLS & EQUIPMENT: hammer, cold chisel, 5 pound short handle sledge hammer, 15 pound long handle sledge hammer, wire cutter, shovel, 1"x4" lumber, 2"x2" stakes, nails, tamper expansion joint material, and spirit level

TASK STEPS:

1. Place obstacles on both sides of construction work.
2. Determine how much sidewalk to remove. Begin breaking concrete at a joint in sidewalk, if possible use a long handle sledge hammer. Wear safety glasses.
3. Continue breaking damaged sidewalk up to a few inches away from the new joint to be made.
4. Cut any reinforcing wire with wire cutters.
5. Remove all broken concrete until you reach and uncover the sand bed under it.
6. Using a cold chisel and small sledge hammer, score the surface of the concrete along the location for the new joint.
7. Continue chiseling concrete until concrete breaks away evenly along the new joint.
8. Remove all broken concrete from damaged sidewalk area.
9. Construct 1"x4" forms along both sides of removed textbook, (see textbook pgs. 475).
10. Hammer in 2"x2" stakes along outside of form to about 10" into ground.
11. Position forms so they are even with surface of existing sidewalk and check forms with spirit level.
12. Nail forms to stakes. The tops of stakes should be hammered down to where they are just below the top of forms, (see textbook pg. 475)
13. Secure expansion joint material to both edges of existing sidealk. Use masonry nails.
14. Press down and level the sand bed to 4" below top forms.

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 300

TASK STEPS:

15. Press down dirt on outside of forms to seal bottom edge of forms. Be sure there are no open spaces at the bottom of forms.
16. Remove all pieces of broken material from work area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read new words that will be presented in following tasks on cement work. See Information Sheet pg. 300-1, in this guide.

2. Look at pictures of tools and process you will use to do this task. See you textbook pgs. 465 to 467, and 475.

3. Read all information listed in Task# 300. See Competency Sheet in this guide.

4. Ask teacher to demonstrate this task. See teacher.

5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

6. Fill-out checklist to see if you have completed Task# 300 correctly. See Student Evaluation Checklist to teacher to check.

7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was the correct amount of damaged sidewalk removed?		
2. Is sand bed 4" below top of form?		
3. Was expansion joint material attached to both edges of existing sidewalk?		
4. Are forms even with existing sidewalk?		
5. Are forms level?		
6. Are forms nailed tightly to stakes?		
7. Is new joint in sidewalk straight?		
8. Are bottom edges of forms sealed with dirt?		
9. Was all broken sidewalk removed from work area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 300

INFORMATION SHEET 300-1

STUDY WORDS:

masonry	construction that is made with brick or stone
barricade	something used as an obstacle to keep people out of an area
forms	studs used to form a structure along all sides of concrete work, (see textbook pg. 475)
stake	a pointed piece of wood that is hammered into ground to help support forms around concrete work
concrete slab	a thick slice of concrete; it is laid as a single piece with no joint, (see textbook pg. 476)
shrinkage	when something becomes smaller and more compact
reinforcing wire	pieces of wire material on which concrete is poured this wire gives extra strength to finished concrete
undercut	to chisel a hole or crack so that along bottom, inside of hole or crack it is wider than opening at surface
cavity	an opening or hole
concrete	a mixture of cement, sand and very small rocks called "gravel," (see textbook pg. 466)
crack	a long narrow opening

VERBS:

To cure	to let concrete dry slowly by keeping it damp with water This permits concrete to harden better

INFORMATION SHEET 300-1
(CONTINUED)

To determine	- to identify or find out some information
To score	- to mark or cut only the surface of something and not all the way through it
To dump	- to let something fall into or down on something else
To slope	- to shape downward at an incline
To stiffen	- to become firm or hard
To allow	- to permit; to let

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Mix, place, finish and cure concrete

TASK NO: 301

STUDENT WILL: Mix concrete and fill existing form with concrete; finish and cure the poured concrete

GIVEN: A section of sidewalk with forms in place, tools and supplies.

TOOLS & EQUIPMENT: strike off board, ball float square shovel, steel finishing trowel, wood float, edger, groover, trowel, 4 foot spirit level, stiff brush, lumber, plastic sheet, and wheel barrel

TASK STEPS:

1. Mix one part cement with three parts sand and four parts gravel. If a mixer is used, put 1/2 the water and gravel needed into the mixer.
2. Start the mixer and put in the sand, cement and the rest of water. Mix for 3 to 5 minutes.
3. Lightly spray sand bed with water to make sand damp.
4. Using a wheel barrel, carry mixed concrete over to sand bed and dump the cement inside the forms.
5. Strike off the top of the concrete using a 2 x 4 or 2 x 6 piece of lumber. Use a back and forth sawing action to remove excess concrete and fill in low places. Leave center of sidewalk a little higher than edges of sidewalk or slope to one side. (see textbook pg. 471)
6. Immediately after striking off smooth out and level surface of concrete with a ball float. Make sure new concrete is level with surface of existing sidewalk.
7. Permit concrete to set or become a little firm.
8. Holding a wood float flat on the concrete surface, move it back and forth across the surface.
9. Trowel the concrete surface with a steel finishing trowel. Use a sweeping action.
10. Using an edging tool, make round the edges along the forms and at the expansion joints.
11. Permit concrete to set up (become firm) a little more.
    NOTE: This may take from one hour to several hours depending on weather conditions.
12. Pull a stiff broom across the top of the concrete to give it a rough surface.
13. Wet the concrete and cover it with plastic sheet. Keep new concrete covered for a least 24 hours.
14. After concrete is cured, remove wood forms. Be careful not to damage new concrete.

(continued on next page)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 301

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and equipment you will use to do this task. See your textbook pgs. 467, 470, 471, and 475.

2. Read all information listed in Task# 301. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 301 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEM TO BE CHECKED	RATING YES	RATING NO
1. Were edges along the forms and at expansion joints made round with edging tool?		
2. Was new concrete permitted to set-up for the correct amount of time?		
3. Is center of sidewalk a little higher than edges of sidewalk or sloped to one side?		
4. Was surface of sidewalk brushed correctly?		
5. Is new concrete even with surface of existing sidewalk?		
6. Are edges of new concrete in good condition and not broken off when forms were removed?		
7. Were all tools and equipment cleaned and returned to storage area?		
8. Was work area left in clean condition?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 301

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Fill a hole in concrete

TASK NO: 302

STUDENT WILL: Fill a hole in concrete using patching cement

GIVEN: A concrete surface that has a hole in it, tools and equipment.

TOOLS & EQUIPMENT: heavy duty hammer, cold chisel, steel trowel, stiff brush, patching cement, water, barricade safety glasses, gloves

TASK STEPS:

1. Barricade work area.
2. Brush out all loose material from damaged concrete area.
3. Chisel out the hole or crack so that the bottom of the inside of the hole or crack is wider than the opening at its surface.
4. Brush out all loose material from hole or crack and wet it with water.
5. Mix the patching cement until it is a smooth mixture.
6. Put patching cement into hole or crack and fill opening a little higher than its outside surface to allow for shrinkage.
7. Allow patching cement to stiffen.
8. Smooth out surface with a steel trowel and let area cure for 24 hours.
9. Remove barricade and clean-up work area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at information on process for repairing concrete. See textbook pg. 479.

2. Read all information listed in Task# 302. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instruction in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 302 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Were barricades used around work area?		
2. Was patched area completely filled with patching cement?		
3. Was patching cement allowed to cure for 24 hours?		
4. Was work all cleaned up?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 302

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENACNE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Install a fastener in a solid masonry wall

TASK NO: 303

STUDENT WILL: Install a fastener in a solid masonry wall

GIVEN: A fastener (see textbook pg. 77), tools and equipment.

TOOLS & EQUIPMENT: rawl and star drills, heavy duty hammer, 1/2 inch portable drill, carbide tip drills, expanding type masonry plug or bolts, safety glasses, and gloves

TASK STEPS:

1. Locate the position of the hole to be drilled on a mortar joint, see textbook pg. 444.
2. Drive a star drill into the masonry wall using a large hammer. Turn the drill a 1/4 turn each time after hitting it with hammer. (Be sure to wear safety glasses and gloves).
3. Clean out the hole you are drilling frequently. Continue drilling until hole is of size needed.
4. Put into hole a masonry plug of the same diameter as hole. If plug is of the lead ring kind, the lead must be compressed with the correct size tool.
5. Attach the bolt through the fastener and thread it into the plug. Tighten bolt well but do not strip threads.
6. Clean up work area and tools. Return tools to storage area.

EVALUATION: Student Evaluation checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See textbook pg. 77.
2. Read all information listed in Task# 303. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed Task# 303 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was hole drilled on a mortar joint?		
2. Is fastener placed evenly against wall?		
3. Was bolt tightened correctly with no stripped threads?		
4. Was work area cleaned?		
5. Were tools cleaned and returned to storage area?		
6. Did student wear safety glasses?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 303

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Repair cracks in a stucco wall

TASK NO: 304

STUDENT WILL: Repair cracks in a stucco wall using mortar

GIVEN: A stucco wall with cracks, tools and supplies

TOOLS & EQUIPMENT: putty knife, hammer, cold chisel, trowel, mortar, sand, stucco coloring pigment, stiff brush, safety glasses, gloves and water

TASK STEPS:

1. Use a putty knife to open the crack until sound (hard) stucco is reached.
2. Use a cold chisel and hammer to undercut the crack so that it is wider on the inside than on the outside surface. Use safety glasses and gloves.
3. Brush out all loose material from the crack and wet down the crack using water.
4. Mix the mortar (one part masonry cement and three parts sand).
5. Mix in enough coloring pigment so that the color of the mortar is the same as the color of the wall you are fixing.
6. Using a small trowel or putty knife, fill the crack a a little higher than its outside surface. Be sure to pack the mortar into a crack tighlty. Let mortar dry for fifteen minutes.
7. Using a trowel, work down the patched surfaces until it is even with the area of wall around it.
8. Using a damp stiff brush, start brushing mortar. Brush until area has the same rough lines as the rest of wall.
9. Wet the crack lightly with a fine spray of water from a garden hose in the morning and evening for three days. (This process is called "moist curing").
10. Clean up any mortar that falls on wall below repaired section.
11. After work is completed, clean up work area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCE: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of process for fixing a crack in stucco wall. See your textbook pg. 480.

2. Read all information listed in Task# 304. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 304 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is patched area even with rest of wall?		
2. Is patched surface the same color as rest of wall?		
3. Do the rough lines made on patched surface match lines on rest of wall?		
4. Is the area of wall below the patch in good condition with no mortar stains?		
5. Was work area cleaned after repairs were completed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 304

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Repair damaged section of stucco wall

TASK NO: 305

STUDENT WILL: Fix a section of stucco wall that is damaged

GIVEN: A stucco wall with damaged area, tools and supplies.

TOOLS & EQUIPMENT: hammer, cold chisel, trowel, mortar, sand stucco coloring pigment building paper, wire mesh, galvanized nails, stiff brush, strike-off board, hawk scratcher, wire brush, safety glasses, gloves, and water

TASK STEPS:

1. Clean out all loose stucco using a hammer and chisel or wire brush. Wear safety glasses and gloves.
2. If wood wall is underneath stucco, nail down building paper over the wood.
3. Cut a piece of wire mesh to fit over building paper and nail it to papaer using galvanized nails. Keep a a 1/4 inch space between the wire mesh and building paper.
4. Place a good amount of stucco (one part masonry cement to three parts sand) on a scratcher then pick up some mortar from scratcher and put onto wall using a steel trowel. See textbook pg. 480.
5. Force the mortar through the wire mesh and build up the mortar thickness to 1/2 inch.
6. Level off mortar using a strike-off board.
7. As soon as mortar is firm, press surface hard enough to score stucco (mortar), but not to remove stucco. Use a scratcher. Always clean off stucco that may fall on other parts of wall when working on wall.
8. Moist-cure the first stucco coat for 24 hours, then let it dry for 24 more hours before applying the finish coat.
9. Mix the finish coat of stucco using the same amounts of masonry cement and sand as before.
10. Put enough coloring pigment into stucco mixture to match rest of wall.
11. Apply finish stucco coat using a steel trowel. Finish coat should be at least 1/8 inch thick.
12. Let finish coat dry until firm and brush until rough lines on surface match rest of wall area.
13. Let finish coat dry 24 hours before moist-curing. Use a light spray of water from a hose to moist-cure and keep area damp for 12 hours.
14. When work is completed, clean up work area.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

TASK NO: 305

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process used to repair damaged section of stucco wall. See your textbook pg. 480.
2. Read all information listed in Task# 305. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 305 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Is patched wall level with rest of wall?		
2. Is patched sruface the same color as rest of wall?		
3. Do the rough lines made on patched surface match lines on rest of wall?		
4. Is the area of wall below the patch in good condition with no mortar stains?		
5. Was work area cleaned after repairs were completed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 305

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Repair leak in masonry wall

TASK NO: 306

STUDENT WILL: Repair a leak in masonry wall using patching cement

GIVEN: A masonry wall that is leaking, tools and supplies.

TOOLS & EQUIPMENT: hammer, cold chisel, steel trowel, stiff brush, patching cement, wire brush, safety glasses, and gloves

TASK STEPS:

1. Clean out all loose cement or mortar.
2. Make opening wider inside at bottom than near the top to keep patching cement from falling out of opening.
3. Follow direction on patching cement package for mixing and applying cement.
4. Pack patching cement tightly into opening.
5. Let it become firm then smooth the surface of cement even with wall around it using a trowel.
6. Follow directions on patching cement package for curing cement.
7. After work is completed, clean up work area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process used to repair leaks in wall. See your textbook pgs. 156 to 158.

2. Read all information listed in Task# 306. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 306 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. After repair has wall stopped leaking?		
2. Is patched area smooth and even with wall around it?		
3. Was work area cleaned up?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK# 306

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Repair chimney brick mortar joints

TASK NO: 307

STUDENT WILL: Repair mortar joints on chimney; bricks

GIVEN: A chimney with loose mortar joints, tools and supplies.

TOOLS & EQUIPMENT: masonry cement, sand, trowel, 2 1/2 pound hammer, stiff brush, water cape chisel, brick jointer, safety glasses, gloves and soft bottom shoes

TASK STEPS:

1. Chisel out all loose mortar to a depth of at least 1/2 inch using a 3/8 inch cape chisel and a 2 1/2 pound hammer. Wear safety glasses, gloves, and soft bottom shoes.
2. Brush loose mortar out of brick joints.
3. Wet the brick face and joints until all is damp using a wet brush.
4. Mix mortar using one part masonry cement and three parts fine sand.
   NOTE: Mix only enough mortar for one hour's work.
5. Pick up mortar along back edge of trowel and force it into brick joints. Repeat this operation until all mortar joints are filled. Keep all mortar off the face of the bricks. Fill vertical joints first, then fill horizontal joints.
6. Before mortar has completely firmed, compress mortar with brick jointer tool to finish joints. This process is called "pointing" the joints. See textbook pg. 456.
7. After mortar becomes hard, clean up face of bricks using a stiff brush.
8. Clean up work area and tools then return tools to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Lock at pictures of tools and process used to repair mortar joints. See textbook pgs. 448-449 and 456-457.

2. Read all information listed in Task# 307. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 307 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHEKCLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student wear safety glasses, gloves, and soft bottom shoes?		
2. Were mortar joints chiseled out at least 1/2 inch?		
3. Were the correct amounts of masonry cement and sand used to make mortar?		
4. Were all joints completely filled with mortar?		
5. Were all mortar joints pointed?		
6. Was all mortar cleaned off of face of brick?		
7. Were all tools cleaned and returned to storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 307

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Masonry Related Duties

JOB TASK: Replace chimney flashing

TASK NO: 308

STUDENT WILL: Replace chimeny flashing

GIVEN: A chimney with damaged flashing, tools and supplies.

TOOLS & EQUIPMENT: mortar, trowel, 2 1/2 pound hammer, cape chisel, tin snips, brick jointer, flashing, pencil, ruler, claw hammer pry bar, roofing nails, matching asphalt shingles, caulking gun, roof cement, safety glasses, and soft bottom shoes

TASK STEPS:

1. Remove one course (row) of shingles all around the chimney using a pry bar. Wear safety glasses and soft bottom shoes.
2. Remove cap flashing using a pry bar and hammer. Start at the top end and work down, (see textbook pg. 176).
3. Use a cape chisel to remove mortar at tup of flashing. Take care not to destroy old flashing because you will use it as a pattern for cutting new flashing.
4. Remove base flashing using a pry bar and hammer. Start at top end and work down.
5. Use a cape chisel to remove old mortar from brick joints where old flashing was attached. Remove mortar to at at least one inch in depth.
6. Using the old flashing as a pattern, outline and cut the new flashing.
7. Bend base flashing to fit the roof line.
8. Bend cap flashing one inch all along top edge at right angles.
9. Caulk around all seams and edges at bottom of base flashing and nail down to roof. Repeat same for sides, then for top of base flashing.
10. Insert bent section of cap flashing into the open mortar joints as indicated. (see textbok pg 177).
11. Mix mortar, (one part masonry cement to three parts sand) and force into open mortar joints. Flashing must be held tight to brick until mortar becomses firm.
12. Nail down roof shingles to replace those you removed.
13. Clean mortar from face of brick and flashing.
14. When mortar is dry caulk the tip of cap flashing at the mortar joints. Use a caulking gun and roof cement.

(continued on next page)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 308

TASK STEPS:

15. Cover any exposed nail heads with roofing cement.
16. Clean up work area and tools. Return tools to storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it=Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process used to replace chimney flashing. See your textbook pgs. 175 to 177.
2. Read all information listed in Task# 308. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 308 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student wear safety glasses and soft bottom shoes?		
2. Are all mortar joints tight where flashing was inserted?		
3. Does flashing fit tight against chimney?		
4. Was all mortar removed from face of brick and flashing?		
5. Were tops of cap flashing caulked?		
6. Were shingles replaced?		
7. Were all exposed nail heads covered with roofing cement?		
8. Were tools and work area cleaned?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 308

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Identify what electricity is and how it works

TASK NO: 400

STUDENT WILL: Identify what electricity is and how it works

GIVEN: A written test

TOOLS & EQUIPMENT: NONE

TASK STEPS: NONE

EVALUATION: Student Evaluation Test. Must score satisfactorily on each item.

RESOURCES: Previews Curriculum

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheets 400-1 and 400-1a in this guide.

2. Read "Safety Rules For Working With Electricity." See Information Sheet 400-2 in this guide.

3. Answer questions in exercise on safety rules. See Information Sheet 400-3 in this guide.

4. Read information on "What is Electricity." See Information Sheet 400-4 in this guide.

5. Read information on "How Does It Work?" See Information Sheet 400-5 in this guide.

6. Read information on "Watts and Kilowatts." See Information Sheet 400-6 in this guide.

7. Answer questions on electricity. See Student Evaluation Test in this guide.

8. Give completed Student Evaluation Test to teacher to check.

WRITTEN TEST
ANSWER QUESTIONS

1. What is electricity?
2. What kind of work does electricity do in industry?
3. When do you see electricity in the sky?
4. Is electricity produced by man?
5. The biggest part of world's electricity is produced by what?
6. What is a generator?
7. From what kinds of energy does a generator get its power?
8. To what can you compare an electic wire?
9. To what can you compare electrons?
10. To what can you compare the thickness of a wire?

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 10
TOTAL POINTS POSSIBLE = 10

TASK# 400

WRITTEN TEST
ANSWER QUESTIONS

QUESTIONS ON WATTS AND KILOWATTS

1. What provides power for light bulbs?
2. Does electricity provide power for other things?
3. How do we measure electrical power?
4. Do all light bulbs use the same amount of power?
5. How many watts of power do some refrigerators use?
6. How does the electric company measure the cost for electrical power you use?
7. How much do you pay the electric company if you use 1,000 watts of power?

UNDERSTANDING WATTS

(use the picture on next page to answer these questions)

1. How many watts of power does the electric dryer use?
2. How many watts of power does the iron use?
3. Which uses more watts of power, the refrigerator or the freezer?
4. Name two appliances that use the same number of watts?
5. Name the appliance that uses the smallest number of watts?

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 12
TOTAL POINTS POSSIBLE = 12

TASK# 400

INFORMATION SHEET 400-1

STUDY WORDS:

matter - anything that has size and weight.

particle - a very small piece of matter.

conductor - a material that electrons can move through easily. A copper wire is an excellent conductor.

insulator - a material that limits the movement of electrons through it. Glass and plastic are good insulators. They keep electricity from getting out of a wire.

electrons - tiny particles that move through a conductor, causing electricity.

electricity - a kind of power or force caused by the movement of electrons. Electricity is a working power that lights lamps, heats appliances, and makes it possible for many power tools to do work for you.

electric current - the movement of electrons through a conductor.

circuit - the path that an electric current follows.

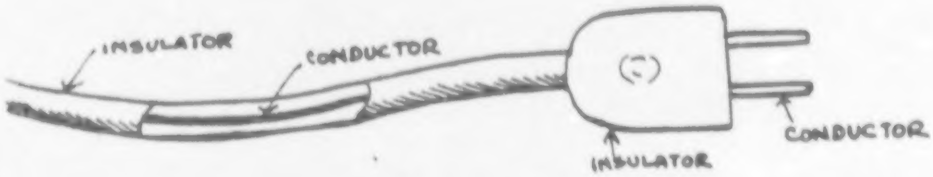
break circuit - shut off the circuit.

voltage, volt - a measurement of the force or pressure that moves electrons through a conductor.

ampere - a measurement of the volume or number of electrons moving through a conductor.

watt - a measurement of electric power or energy. Example: a 65 watt light bulb uses more energy than a 40 watt light bulb.

charge - the action of attracting or repelling. Electrical charges are either positive (+) or negative (-).



Resource# 1
Previews Curriculum

INFORMATION SHEET 400-1a
(CONTINUED)

STUDY WORDS:

positive charge - (+) when there are not enough electrons, as compared to the negative charge.

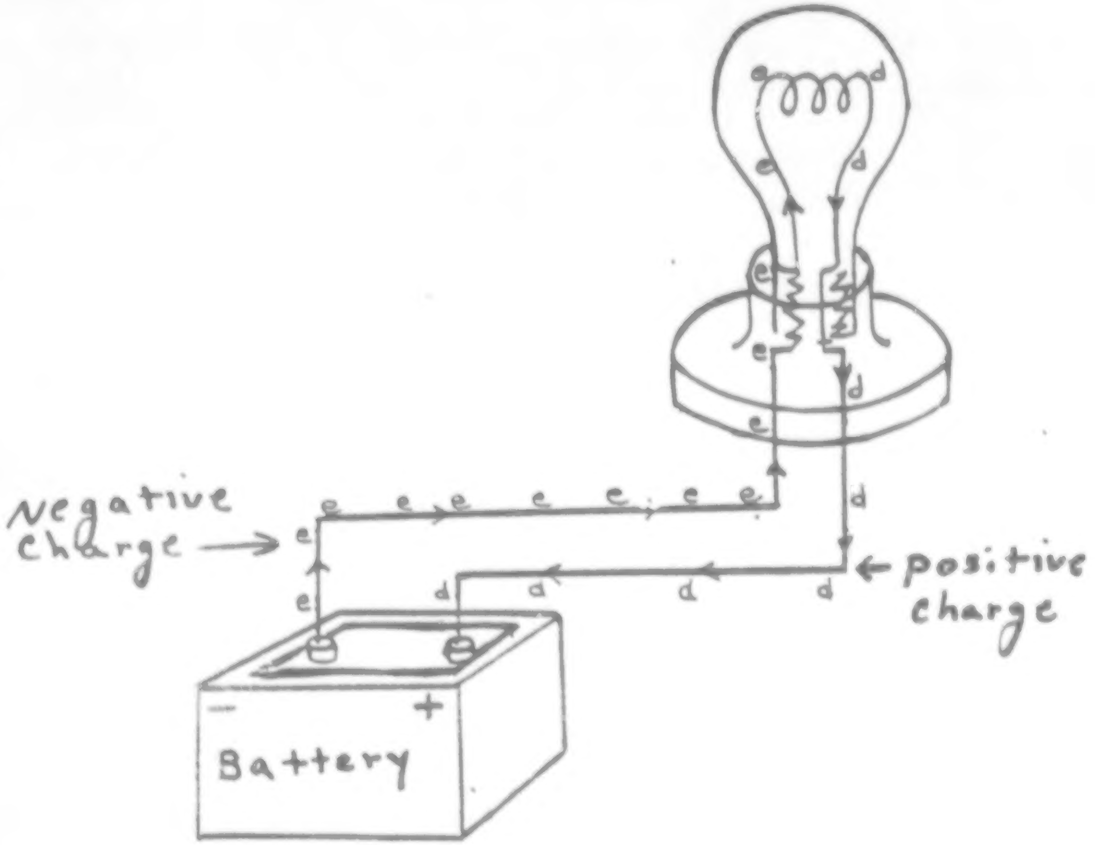
negative charge - (-) when there are too many electrons, as compared to the positive charge.

attract - to move towards each other. Electrons sometimes move towards each other.

repel - to push away. Electrons sometimes push away from each other.

like - means "same." Two negative charges are the same. Two positive charges are the same. Like charges repel each other.

unlike -"different." Negative and positive charges are unlike. They attract each other. The greater the difference, the higher the voltage is.



Resource# 1 continued

INFORMATION SHEET 400-2

SAFETY RULES FOR WORKING WITH ELECTRICITY

1. Never use cords that have cracked, frayed or bare spots.

2. Never do electrical work in a damp or wet area. Water is a good conductor of electricity.

3. Make sure that all electrical appliances and tools are in good working condition.

4. When you are going to work on an electrical circuit,first break the circuit you are going to work on. To do this, shut off the relay or take out the fuse that controls that circuit.

5. Keep your work area clean. Make sure no flammable or explosive materials are in or near the work area.

6. Unplug electrical power tools after you finish using them.

7. When you are working on electrical equipment, make sure the handles on metal pliers are insulated. Plastic handles are good insulators.

8. Follow all factory safety rules in handling electrical equipment.

Resource# 1 continued

INFORMATION SHEET 400-3

QUESTIONS ABOUT SAFETY RULES

EXERCISE: (Circle the correct answer.)

1. Never use cords that are:

   A. thicker
   B. long
   C. frayed

2. In a wet work area you should:

   A. wear a heavy hat
   B. wear rubber boots
   C. never do electrical work

3. All electrical appliances and tools must be:

   A. in clean condition
   B. in good working condition
   C. in good used condition

4. To break an electrical circuit you should:

   A. switch off lamps
   B. cut the wire
   C. use a circuit breaker

5. In your work area there should not be any:

   A. explosive materials near
   B. expensive materials near
   C. extra materials near

6. After you finish working with electrical power tools make sure you:

   A. clean them
   B. unplug them
   C. know where to put them

7. When you work with metal pliers make sure:

   A. the handles are long
   B. the handles are insulated
   C. the handles are short

Resource# 1 continued

WHAT IS ELECTRICITY?

Electricity is a kind of power or force that helps do many types of work. In homes, electricity lights lamps, keeps homes warm in winter,and powers appliances. In industry, electricity makes it possible for machinery and elevators to work. In communications, electricity makes radios, telephones, televisions, and telegraphs work for you.

Electricity gets its power from tiny moving particles. These particles are called "electrons".

You see electricity in the sky on a stormy day. You see it in the flash of light produced when electricity jumps from one cloud to another or between a cloud and the earth or ground. This type of electricity is not man-made. It is created by nature.

Electricity is also produced by man. Man produces electricity with chemicals, for example, the chemicals in a battery. Man can produce electricity with generators, too. A generator is a machine that uses mechanical energy and changes it to electrical energy. A generator get its mechanical energy from coal, oil, moving water,or nuclear energy. The biggest part of the world's electricity comes from generators.

Resource# 1 continued

INFORMATION SHEET 400-5

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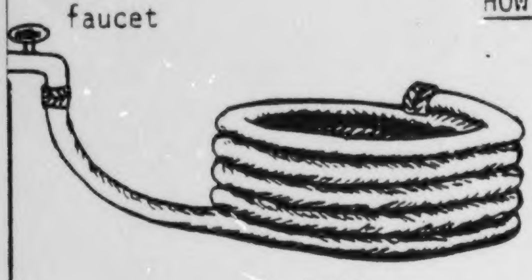
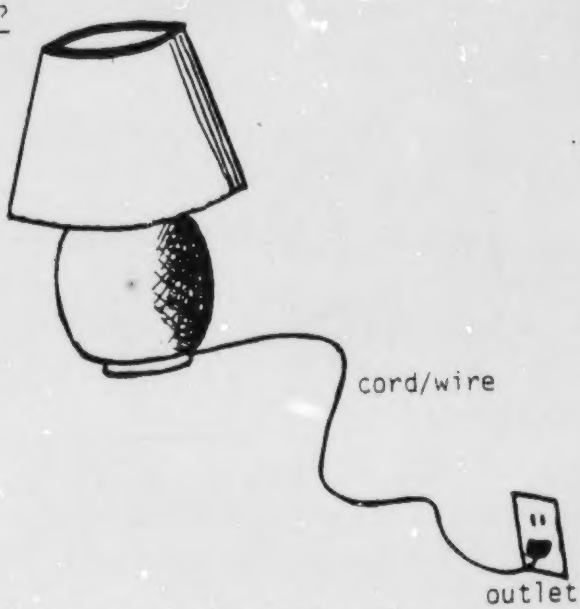
HOW DOES IT WORK?





We can compare now electricity works with the way a garden hose works:

1. Think of a garden hose as an electric wire.
2. Water moves through a hose as electrons move through a wire.
3. We measure the force or pressure of water moving through the hose in gallons per minute. We measure the force or pressure of electrons moving through the wire in voltage.
4. When the diameter of a hose is bigger, a greater volume of water will move through it. When you have a thicker wire a greater volume of electrons can move through it. We measure the volume of electrons in amperes.

Review

A garden hose is compared to an electric wire.

Water is compared to electrons.

A pump is compared to voltage.

The diameter of a hose is compared to the thickness of a wire. We measure the volume of electrons in amperes.

Resource# 1 continued

WATTS AND KILOWATTS

You now know that electricity is a force or power caused by the movement of electrons. We measure electrical power in watts. For example, an electric light bulb that uses 60 watts of power provides more light to a room than a 40 watt light bulb.

In our homes we have electrical appliances. Each appliance uses electrical power to operate. Some clocks use as much as two watts of power, an electric stove as much as 16,000 watts of power, and a refrigerator, 250 watts of power.

You must pay the electric company for the amount of electrical power you use. This cost is measured in kilowatt hours.

A kilowatt hour is 1,000 watts that you use for one hour.

Resource# 1 continued

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE:	Electrical Related Duties
JOB TASK:	Identify what a ground is and the danger that exists when electrical equipment is not grounded
TASK NO:	401
STUDENT WILL:	Identify a ground and the danger that is present when power equipment is not grounded
GIVEN:	A written test
TOOLS & EQUIPMENT:	None
TASK STEPS:	None

EVALUATION: Student Evaluation Test. Must score satisfactorily on each item.

RESOURCES: Basic Electricity. New Jersey Dept. of Education

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LEARNING ACTIVITIES

1. Read Information Sheet 401-2 to 401-3 in this guide to find out what is a ground?
2. Answer questions about grounding on Activity Sheet 401-4 in this guide.
3. Read Information Sheets 401-5 to 402-9 in this guide which identify dangers connected with electrical equipment that is not grounded.
4. Choose correct answers to final questions in guide. See Student Evaluation in this guide.
5. Give completed Student Evaluation Test to teacher to check.

WRITTEN TEST
Check the correct answer

1. What is a ground?

   -- the metal sheathing of BX cable
   -- metal boxes for electrical connections
   -- an electrical connection to the earth

2. What is a good grounding connection?

   -- television antenna
   -- a cold-water pipe
   -- power lines coming into a house

3. What danger do equipment grounds protect you from?

   -- power loss
   -- electrical shock
   -- drilling errors

4. What kind of receptacles should be used to connect electrical appliances in a home?

   -- three wire type
   -- two wire type
   -- four wire type

5. What can happen if high-voltage current goes through a person?

   -- it can kill the person
   -- it can hurt the person
   -- all the above
   -- none of the above

6. When a hot wire that is not insulated touches the metal case of a drill, what is this called?

   -- ungrounded drill
   -- open circuit
   -- accidental ground
   -- electrical receptacle

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 401

INFORMATION SHEET 401-1

What is a Ground?

VOCABULARY:

contact (kon′-takt) — to touch; a touching of something.

sheathing (shēth′-ing) — a covering.

branch — a smaller part coming from a large part, like the branch of a tree.

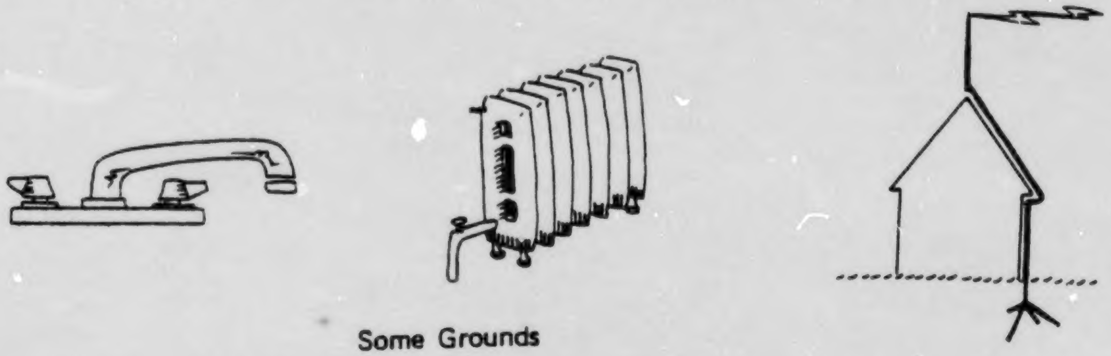
case (kās) — outside covering of a motor, machine, or appliance.

INFORMATION:

A *ground* is *an electrical connection to the earth.*

Most often it is a *connection to a pipe that goes into the earth* and makes a good contact with the earth.

A cold-water pipe is a very good ground connection.



Some Grounds

Resource# 1
Basic Electricity, New Jersey Dept.
of Education

Power lines coming into a house must be grounded.

All branch circuits must be grounded.

The metal sheathing of BX cable must be grounded.

Aerials for radio and TV must be grounded.

Metal boxes for electrical connections must be grounded.

The metal cases of *all electrical appliances should be grounded.* Sometimes small appliances are not grounded. We will see in the next lesson what can happen.

Why is grounding needed?

Grounding can

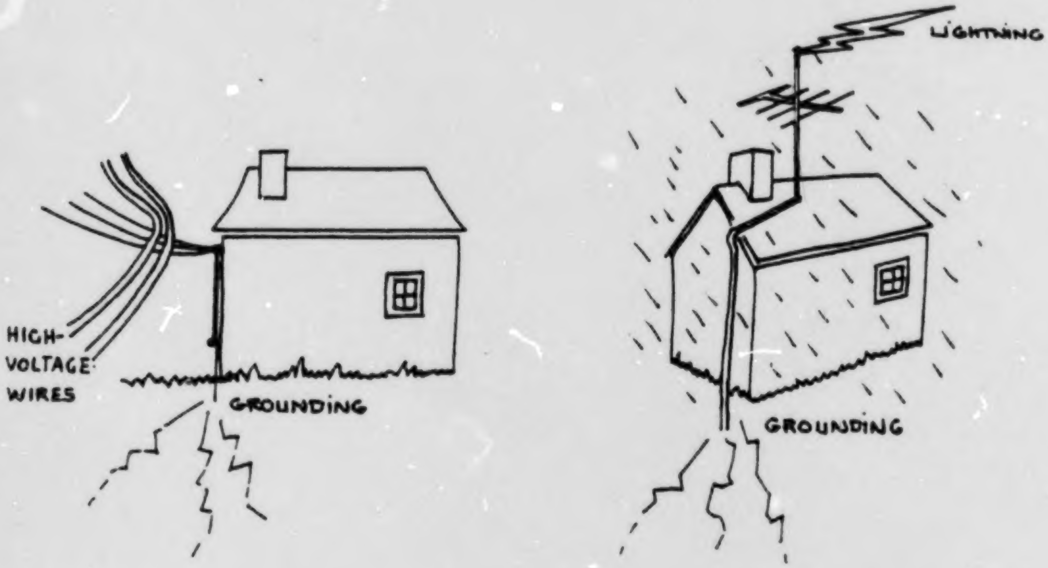
(1) Prevent electrical fires.
(2) **Save your life.**

The earth we live on is a very fine conductor of electricity. It protects our buildings and ourselves.

Resource# 1 (CONTINUED)

INFORMATION SHEET 401-3

Suppose lightning strikes a house. Or suppose a high-voltage electric line falls and makes contact with the wires running into the house. The grounding will conduct the electricity into the earth and there will be no damage.


HIGH-VOLTAGE WIRES
GROUNDING
LIGHTNING
GROUNDING

Grounding protects your house from fires.

Without grounding, there could be a fire.

Without grounding, a person inside the house could get killed from an electric shock.

Resource# 1 (CONTINUED)

ACTIVITY SHEET 401-4

1. What is a ground?

2. Name two good grounds.

   a.

   b.

3. Name five things in a house electrical system that must be grounded.

   a.

   b.

   c.

   d.

   e.

4. Grounding can prevent ____________.

5. Grounding can save your ____________.

Resource# 1 (CONTINUED)

INFORMATION SHEET 401-5

Grounding Electrical Equipment

You will know how grounding protects the user.

VOCABULARY:

equipment (ī-kwip'-ment) — tools, appliances, small machines, etc.

user (ū'-zer) — a person who uses something.

frame (frām) — strong metal part that holds the moving parts of a tool or appliance.

portable (pôr'-tə-bl) — easy to carry around.

hazard (haz'-ərd) — a danger; something that can easily cause an accident.

defective (di-fek'-tiv) — having something wrong; not made right.

receptacle (ri-sep'-tə-kl) — a small box to push electrical plugs or caps into, to connect with an electrical circuit.

prong — a small pointed thing that sticks out.

INFORMATION:

As we said in the last lesson, the metal cases of all electrical equipment should be grounded. Why?

Usually, electrons stay in the wires where they belong. But sometimes insulation gets damaged or rubbed off. Then the electrons flow from the wires

Resource# 1 (CONTINUED)

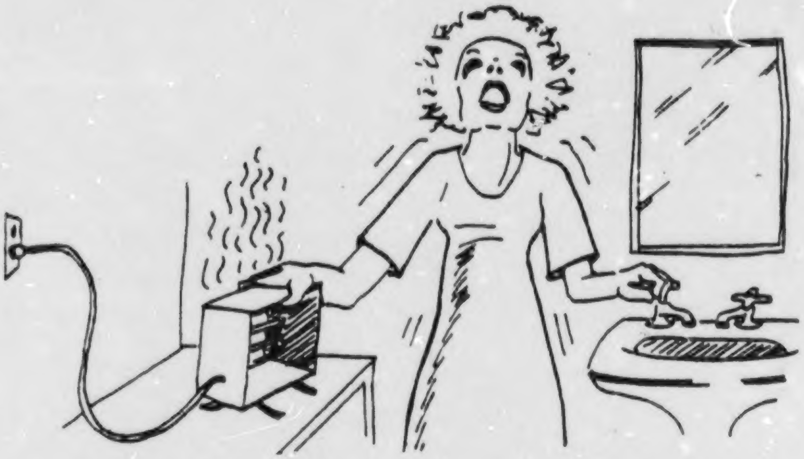
to any other conductor contacting the wires. This could be the metal frame or case of the appliance.

Often this can happen and the appliance will still work. You may use the appliance and never know that there is something wrong with it.

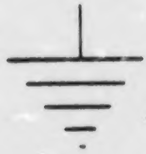
One day you may touch the appliance and touch the ground (like a faucet) at the same time. *If the appliance has not been grounded,* the electric current will go right through your body and down into the ground.

You should know that even *new* appliances are sometimes defective. It is just as important to ground a new tool as an old tool.

For safety, all of the receptacles should be the three-wire type as shown before. If they are not, there are other ways to ground large appliances.



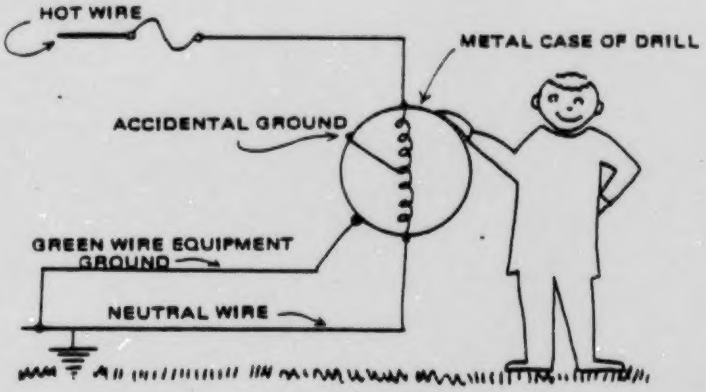
This symbol indicates a connection to ground.



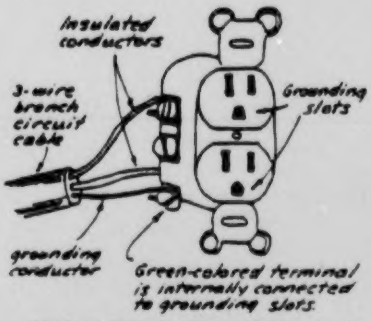
If the appliance *has* been grounded, you will not feel anything!

INFORMATION SHEET 401-7

The user – shown below – is now protected against an electric shock.


HOT WIRE
METAL CASE OF DRILL
ACCIDENTAL GROUND
GREEN WIRE EQUIPMENT GROUND
NEUTRAL WIRE

If an accidental ground happens, current flows to the metal case of the drill, through the green equipment ground wire, and into the earth. This is a safe installation.


Insulated conductors
3-wire branch circuit cable
Grounding slots
grounding conductor
Green-colored terminal is internally connected to grounding slots.

GROUNDING RECEPTACLE

The picture above is a grounding receptacle. The U-shaped opening is for the third prong on the 3-wire end cap.

This third prong is the *equipment grounding connection* between your appliance and the continuous equipment ground in your home, factory, or store.

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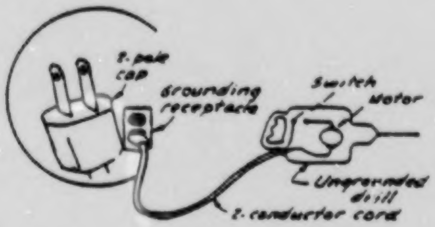
INFORMATION SHEET 401-8

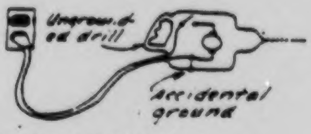
When there is contact between the metal wires of a machine and the frame or casing, this is sometimes called an *accidental ground.*

Here is a diagram of a portable electric drill. This is the sort of tool that is easily damaged. It is not grounded.


2-pole cap
Grounding receptacle
Switch
Motor
Ungrounded drill
2-conductor cord

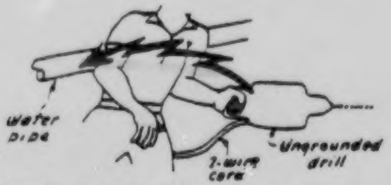
The next diagram shows a drill with damaged insulation. Current can flow from a hot motor wire to the metal case. The case will become "hot" too. It has an accidental ground in it.

Often the drill will still work, and you will not know it is a hazard.


Ungrounded drill
Accidental ground

ACCIDENTAL GROUND

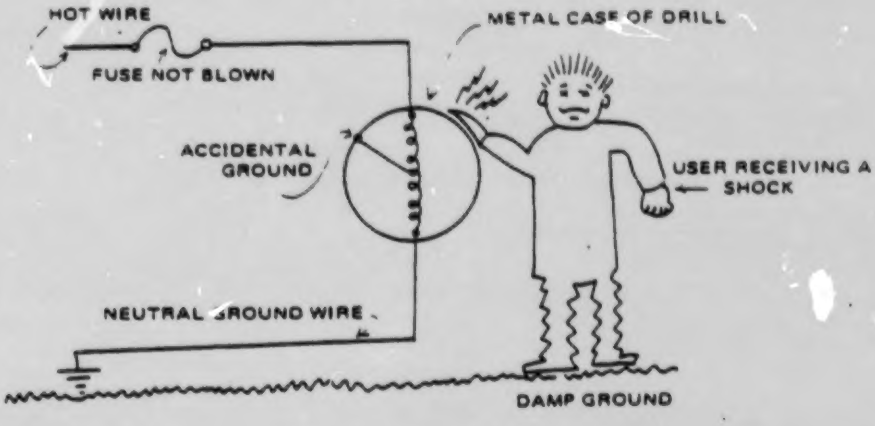
One day you may pick it up while standing on a damp cellar floor or touching a ground. Then – zap! You get a big shock!


Water pipe
2-wire cord
Ungrounded drill

SHOCK HAZARD

INFORMATION SHEET 401-9

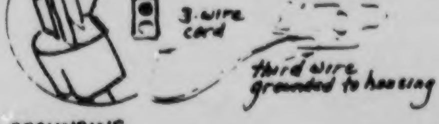
The picture below shows how this happens. The electric circuit is grounded, but the metal case of the drill is not.


HOT WIRE
FUSE NOT BLOWN
METAL CASE OF DRILL
ACCIDENTAL GROUND
USER RECEIVING A SHOCK
NEUTRAL GROUND WIRE
DAMP GROUND

The current flows from the hot wire through the *accidental ground* to the case of the drill, *through the user,* and into the damp ground.

If the voltage is high enough, the user can get killed. If not, he will get a terrible shock and a burn.

The picture below shows how a drill should be wired. Attached to the drill is a three-wire cord and end cap. The third (green) wire is *connected inside to the metal case (housing) of the drill.*


3-wire cap
3-wire cord
third wire grounded to housing

GROUNDING

COMPETENCY SHEET
PROJECT VOICE
BUILDING NAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Locate and identify parts in a house's service entrance hookup and fuse box

TASK NO: 402

STUDENT WILL: Locate and identify parts in a house's service entrance hookup and fuse box

GIVEN: A house's service entrance hookup and fuse box, tools and equipment.

TOOLS & EQUIPMENT: screwdriver, small socket wrench set, fuse puller, 260 voltmeter, flashlight, and extra fuses

TASK STEPS:

1. Find count and determine size of service wires going into main service panel, (see textbook pg 256).
2. Remove main and range pullouts if working on a fuse box or turn off main disconnect if working on a circuit breaker panel, (see textbook pg. 252).
3. Remove cover from main service panel.
4. Locate the color and size of main wire lines, (service drop), going into the service entrance box from power company. Also, count the number of these wire lines (see textbook pg. 256).
5. Locate the bare copper main ground wire and find out where it goes. Look for ground rod near the electrical watt hour meter or ground connection to main water pipe, (see textbook pg. 257).
6. Locate ground/neutral busbar and find out color of wire connected to this busbar.
7. Locate 20 volts and 240 volt circuits and find out the wire color of these circuits, (see textbook pg. 256).
8. Replace or turn on main disconnects.
9. Using a voltmeter, set meter to 250 AC volts and measure voltage at several circuit terminals.
10. Remove fuses, one by one to determine which fuses control each circuit.
11. Find out what the amperage is for each fuse, (see textbook pg. 253)
12. Remove main disconnects or turn off main circuit breakers.
13. Replace main service panel cover.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

TASK NO: 402

TASK STEPS:

14. Replace main disconnects or turn on main circuit breakers.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook -Complete Do-it-Yourself Manual Previews Curriculum

LEARNING ACTIVITIES

1. Look at pictures of tools and equipment you will use to do this task. See textbook pgs. 252 to 258.
2. Read information on house electricity. See Information Sheet 402-1 and Activity Sheet 402-2, in this guide.
3. Read all information listed in Task# 402. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
6. Fill-out checklist to see if you have completed Task# 402 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student locate service entrance hookup and fuse box?		
2. Did student indentify parts in circuit breaker panel and in fuse box?		
3. Were main disconnects removed or turned off service panel cover?		
4. Were main wire lines located and identified?		
5. Did student find out where the main ground wire goes?		
6. Did student measure voltage at several circuit terminals using voltmeter?		
7. Did student find out which fuses control each circuit?		
8. Did student find out the amperage for each fuse?		
9. Did student remove or turn off main disconnects before replacing service panel cover?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

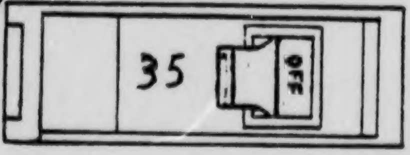
TASK# 402

INFORMATION SHEET 402-1

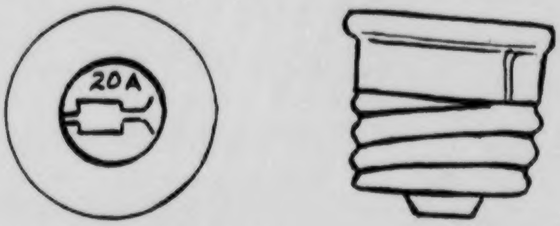
HOUSE ELECTRICITY

Your house electricity is on 12 or 14 gauge wiring. These wires are thinner than most wires used for large heating appliances. Sometimes we use too much electricity at the same time in our homes. There are relay or fuse boxes in our homes and other buildings. They tell us how much amperage we can safely use from each circuit in a building. A relay or fuse is often called a "circuit breaker". If we use more amperage than a relay or fuse shows, it will shut off or break the circuit it controls. The circuit will break before the wires get too hot. A circuit breaker prevents the building from burning.

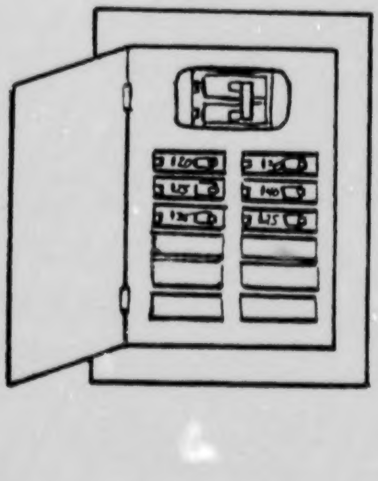
Relay or Circuit Breaker



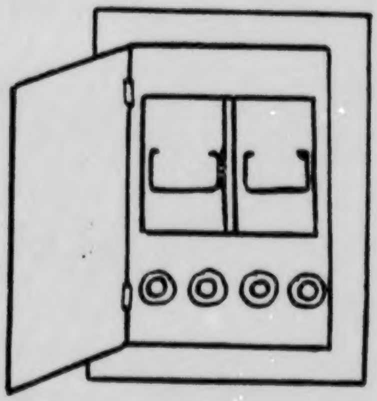
Fuse or Circuit Breaker



Relay Box



Fuse Box



ACTIVITY SHEET 402-2

DIRECT AND ALTERNATING CURRENTS

Review: (Current is the movement of electrons through a conductor.)

Direct current, also called D.C., is current that moves only in one direction. Equipment that gets its power from batteries is D.C. Examples of this equipment are: flashlights, some portable radios, and car batteries. As you use this equipment, the power in the batteries begins to go down. Finally, the batteries lose their power and you must recharge them or buy new batteries.

Alternating current, also called A.C., is current that moves in one direction, then in the opposite direction. It does this 60 times per second. Homes and industries get their electrical power from alternating current. This current comes from the generators at the electric company. One important difference between D.C. and A.C. is that in D.C. the electrons are moving in the same direction all the time. In A.C. the electrons are moving in one direction, then in the opposite direction.

QUESTIONS: DIRECT AND ALTERNATING CURRENTS

EXERCISE IX

1. What is "current"?
2. What is "direct current"?
3. Name a kind of equipment that uses direct current?
4. Is direct current used for most homes?
5. Is direct current used in most radios?
6. What is "alternating current"?
7. Where is alternating current used?
8. Do most flashlights use alternating current?
9. Do some radios use alternating current?
10. Do some radios use direct current?

Resource #1
(CONTINUED)

Program	Task	Page
	402	2

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Connect D.C. and A.C. volt power supplies together and measure voltage

TASK NO: 403

STUDENT WILL: Connect a D.C. (direct current) supply tools, and equipment.

TOOLS & EQUIPMENT: oscilloscope, D.C. power supply, A.C. (alternating current) source, voltmeter, and test leads

TASK STEPS:

1. Connect D.C. power supply to 120 A.C. power source. See pictures of power supply and carefully read safety rules on information Sheet 403-2 in this guide.
2. Using a voltage on voltmeter, set selector to A.C. volts and connect test leads to points "A" and "B".
3. Read voltage on voltmeter.
4. Connect input oscilloscope leads to points "A" and "B", then turn on the scope and adjust scope controls to display two or three complete sine waves.
5. Move test leads to points "C" and "D", but do not change scope controls. Identify any changes in shape of sine waves.
6. Move test leads again to points "E" and "F". Identify any changes in shape of sine waves.
7. Using the voltmeter with selector set at D.C. volts, measure the D.C. volts across points "C" and "D", and across points "E" and "F".

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet 403-1 in this guide. Also read safety rules on Information Sheet 403-2 in this guide.

2. Read all information listed in Task# 403. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instruction in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 403 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Was power supply connected correctly?		
2. Was voltmeter used correctly to measure A.C. volts?		
3. Was oscilloscope adjusted correctly for good quality sine waves?		
4. Was voltmeter used correctly to measure D.C. volts?		
5. Did student follow the necessary safety rules listed on Information Sheet 403-2 in this guide?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 403

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INFORMATION SHEET 403-1

STUDY WORDS:

oscilloscope - an instrument in which you can see a picture on a screen of sine waves. These waves which are curved lines show changes in the amount of electrical current that is present

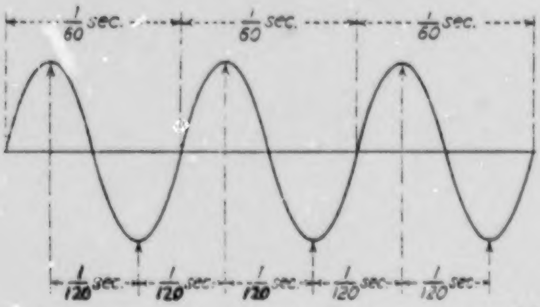


Fig. 3-3 Three cycles of 60-cycle alternating current. All the changes shown take place in 3/60 or 1/20 sec.

points - places, locations

electrons - tiny particles that move through a conductor, causing electricity

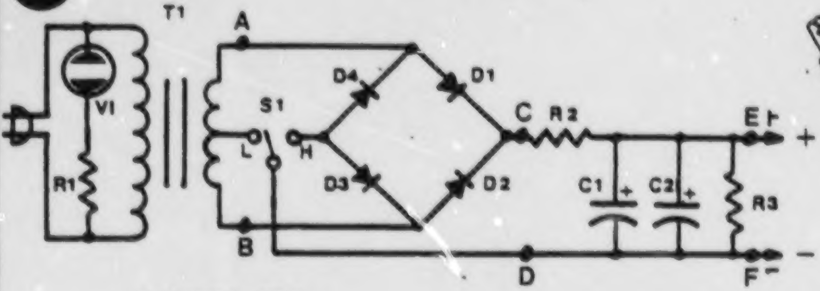
volts, voltage - a measurement of the force or pressure that moves electrons through a conductor

VERBS:

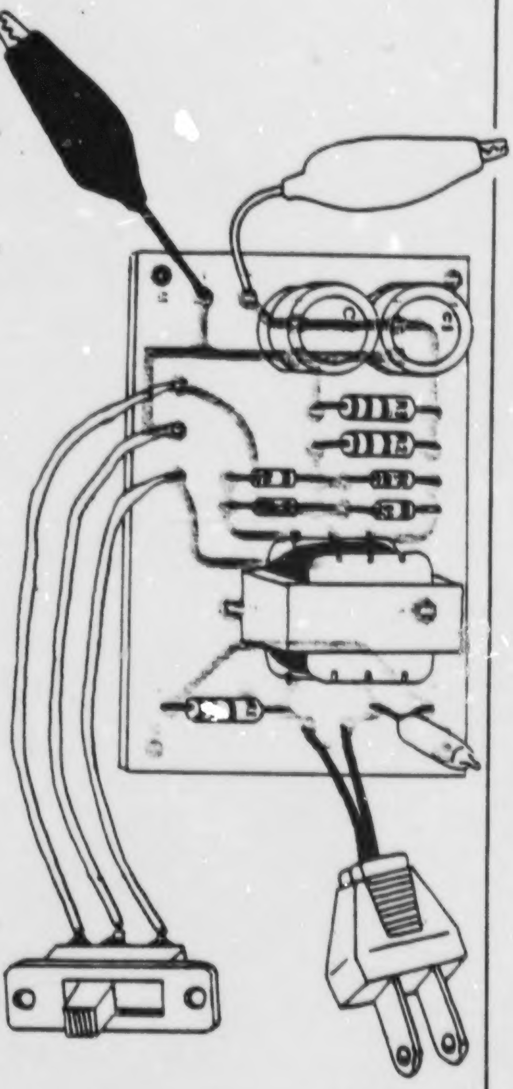
To display - to show

INFORMATION SHEET 403-2

6/9 VOLT POWER SUPPLY



SCHEMATIC



PARTS LIST

Qty.	Symbol	Description
1	R1	Resistor, 47K ohms
1	R2	Resistor, 10 ohms
1	R3	Resistor, 1K ohms
2	C1,2	Capacitor, Electrolytic, 470 uF
1	T1	Transformer, Power, 117:12 v.
1	V1	Neon Lamp, NE-2
4	D1-4	Diode, Silicon, Power
1	S1	Switch, Slide, SPDT
1		AC Line Cord
1		Test Lead Wire Set
1		Alligator Clip, Red
1		Alligator Clip, Black
1		Solder, 12"
1		Instruction Sheet

SAFETY

Everyone knows that electricity can be dangerous and even fatal to those who do not understand and practice the simple rules of SAFETY, but, many people seem to forget this at times. The first rule of personal safety is always,

"THINK FIRST"

Remember that, when properly used, electricity is a useful servant of man, but when misused, electricity is very dangerous and can cause severe bodily harm. Therefore, always use care when working with electricity and observe these rules.

1. Unplug power cord from wall receptacle BEFORE making wiring changes.
2. Use only one hand when testing a circuit.
3. Always have another person present when conducting tests.
4. Keep the printed circuit board on a wooden or non-metal surface when working on or testing its circuits. NEVER stand on damp or wet floors.
5. Remember that shock is only one of the possible hazards. Even a minor shock can cause a violent muscular reaction that can injure you by causing you to fall, collide with work benches and other furniture, or make contact with a source of higher voltage.
6. THINK SAFETY

Program	Task	Page
	403	2

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Test and replace fuses and circuit breakers

TASK NO: 404

STUDENT WILL: Identify types and values of fuses and circuit breakers

GIVEN: Circuit box with fuses and circuit breakers, extra fuses of several different types.

TASK STEPS:

1. Test continuity (no break in connection) of extra cartridge fuses, using both good and bad fuses. Test with V.O.M test meter at r x 1 on ohms meter scale.
2. Replace fuse links in cartridge fuses that can be used again, (see textbook pg. 252).
3. Test extra plug fuses, fusetron fuses, and other types of fuses using V.O.M. test meter as before.
4. Pull out main disconnects on fuse box to get to main fuses. Pull out cartridge-type fuses. Pull straight out; put in new fuse of same capacity type. Use a fuse puller to take out and replace fuse.
5. Trip release or shut off switch on circuit breaker with a circuit breaker with a circuit under load (having something electrical conected to circuit). All appliances in that circuit should stop or turn off.
6. Return circuit breaker switch to the "on" position. Appliances should turn on.
7. Replace a circuit breaker by tripping (shutting off) main disconnect then remove branch circuit wire, taking off any attached screws, and pulling out the circuit breaker.
8. Push in new circuit breaker, connect branch circuit wire, and turn main disconnect to the "on" position.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item..

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of several different types of fuses. See your textbook pg. 252.

2. Read all information listed in Task# 404. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See Teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instruction in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 404 correctly.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Were main disconnect removed or turned to the "off" position before replacing fuses?		
2. Was a fuse puller used to take out and replace cartridge fuses?		
3. Do cartridge fuses with replaced fuse links work properly in circuit?		
4. Were new fuses put in that have the same capacity as the fuses that were removed?		
5. Was circuit breaker replaced correctly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 404

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Check voltage, amperage, and resistance on energized A.C. circuit (alternating current) circuit

TASK NO: 405

STUDENT WILL: Check voltage, amperage and resistance on an energized A.C. circuit with a resistance load

GIVEN: An energized A.C. circuit with a resistance load, tools and equipment.

TOOLS & EQUIPMENT: v.o.m. test meter, amp-probe, test leads, and an energized circuit with a resistance load

TASK STEPS:

1. Measure the input voltage on the A.C. circuit using a v.o.m. test meter.
2. Using an amp-probe test meter measure the A.C. amperage load on the circuit.
3. With power turned off from the circuit, measure the A.C. resistance (ohms) of the load as indicated.
4. Using ohms law E=IR (voltage = amperage x restistance) Use the measurements you found with the v.o.m. test meter to work the ohms laws formula. Values from formula should agree with values you tested for.

EVAUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read new words that will be presented in this task. See Information Sheet 405-1 in this guide.

2. Read all information listed in Task# 405. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out **checklist** to see if you have completed Task# 405 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was input voltage measured correctly?		
2. Was amperage measured correctly?		
3. Was power turned off from circuit before resistance was measured?		
4. Did values from ohms law formula agree with values you measured using the v.o.m. test meter?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 405

INFORMATION SHEET 405-1

STUDY WORDS:

electrons	- tiny particles that surround the nucleus on an atom
amperage	- a measure of the amount or number 0
resistance	- something that stands against or makes difficult the movement of constant electricity through it
resistance load	- the power that resistance puts out
energized	- filled with electric power
input	- the electric power that's inside circuit
output	- the electric power delivered by circuit
values	- number amount
measurement	- the amount or capacity of something

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Use the National Electrical Code book to find information

TASK NO: 406

STUDENT WILL: Locate rules and processes on house wiring

GIVEN: A copy of the National Electrical Code book.

TOOLS & EQUIPMENT: paper and pencil

TASK STEPS:

1. Attend demonstration given to learn how to use code book.
2. Find the section in the code book that give general definition (explain meanings of words and expressions). List page numbers.
3. Find the section in code book and list the page numbers that give the following information:

    A. Wiring design and protection
    B. Wiring methods and materials
    C. Equipment for general use
    D. Special conditions
    E. Tables and examples
    F. New rules and regulations

4. Practice using the index, at back of book, to locate information on:

    A. Television systems
    B. Service drops- point of attachment (connection)
    C. Protection - electrical metallic tubing

5. List page number for information found in index.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: National Electrical Code, International Brotherhood of Electrical Workers, Ed., 1975

LEARNING ACTIVITIES

1. Watch teacher demonstrate how to locate information in National Electrical Code book.

2. Read all information listed in Task# 406. See Competency Sheet in this guide.

3. Using the code book, find the location for the information listed on the Competency Sheet in "TASK STEPS." List page numbers of book where information is found.

4. Fill-out checklist to see if you have completed Task# 407 correctly. See Student Evaluation Checklist in this guide.

5. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student find the section in code book that gives general definitions?		
2. Did student find the section in code book that explains wiring design and protection?		
3. Did student find the section in code book that explains wiring method and materials?		
4. Did student find the section in code book that explains equipment for general use?		
5. Did student find the section in code book that explains special conditions?		
6. Did student find the section in code book that shows tables and examples?		
7. Did student find the section in code book that gives new rules and regulations?		
8. Did student use index correctly to locate specific electrical areas?		
9. Did student list page number for all information that was located in code book?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 406

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install main electrical service panel

TASK NO: 407

STUDENT WILL: Complete the wiring from the watt-hour meters ring to the service panel (fuse box)

GIVEN: A house with the electrical service entrance hookup completed only to the watt-hour meter ring, tools and equipment.

TOOLS & EQUIPMENT: portable drill, bits, screwdriver, tubing cutter, metallic tubing box connectors, entrance wire, service panel screws, wire stripper, continuity tester and safety glasses

TASK STEPS:

1. NOTE: Always wear safety glasses to protect eyes, when operating tools. Always shut off or disconnect power before touching wires.
2. Determine the size of wire for fuse box. See Table No. 1 pg. 557 in National Electrical Code book as indicated.
3. Determine size of metallic tubing. See Table No. 4 pg. 562 in National Electrical Code book as indicated.
4. Locate position of fuse box on inside of house and screw fuse box to wall.
5. Connect metallic tubing from fuse box to lower end of service hookup, (bottom of meter ring), see textbook pg. 253.
6. Pull wire through tubing using 3 wire cable No. 2 for 100 amperes service. Wire color should be 2 black and 1 white or 1 black, 1 red, and 1 white. See textbook pg. 261).
7. Connect wires to terminals of watt hour meter ring, (white wire to ground terminal, other two wires to other terminals).
8. Connect opposite end of wires to terminals of fuse box, (white wire to ground terminal and other two wires, which are both black or black and red, to separate large connectors in fuse box.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

TASK NO: 407

TASK STEPS:

9. Connect No. 4 or No. 6 braid wire, (see textbook pg 261) from fuse box ground terminal to cold water pipe or outdoor ground rod.
10. Check all connected wires using a continuity tester.
11. Check to see that all wire connectors at fuse box and at meter ring are tightened well. If necessary tighten more.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
National Electrical Code 1975,
International Brotherhood of Electrical
Workers, ed., 1975 pgs. 557 and 562

LEARNING ACTIVITIES

1. Read information on amperes. See Information Sheet 407-1 in this guide.
2. Look at pictures of electric power hookup going into house. See textbook pgs. 253, 256, 257, 261. Also, carefully read safety information in box at bottom of pg. 256 in textbook.
3. Read all information listed in Task# 407. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
6. Fill-out checklist to see if you have completed Task# 407 correctly. See Student Evaluation Checklist in this guide.
7. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student choose the correct color and wire size for fuse box and ground rod?		
2. Did student choose the correct size of metal tubing?		
3. Did student connect all wires correctly in fuse box and meter ring?		
4. Did student check all connected wires using a continuity tester?		
5. Did student connect ground wires properly for fuse box and meter ring?		
6. Are all wire connections tight?		
7. Did student wear safety glasses?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 407

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Divide branch circuits to stop electrical overload (too many appliances operating at the same time on circuit)

TASK NO: 408

STUDENT WILL: Divide branch circuits to stop electrical overload so fuse will not burn out or circuit breaker will not trip

GIVEN: A home 240 volt, 100 amp main service panel, tools and equipment.

TOOLS & EQUIPMENT: screwdriver amp-probe test meter, volt meter, flashlight, fuse plugs, and cartridge fuses

TASK STEPS:

1. Using house floor plan and appliance wattage, Table on pg. 254 of textbook, list minimum circuit requirements, examples:
   A. Kitchen-minimum of one-20 amp, 120 volt circuit
   B. Laundry room-minimum of one-20 amp, 120 volt circuit
   C. Furnace room-minumum of one-20 amp, 120 volt circuit
   D. Electric range (stove) seperate 40 amp, 240 volt circuit
   E. Lighting and samll appliances-15 amp, 120 volt circuits
2. Shut off main electrical power.
3. Connect branch circuit wire lines for locations listed above in No.1 (A through D) to separate fuses or circuit breakers. Use 20 amp, plug fuses on all these circuits except electric range circuit. Use 40 amp cartride fuses for range circuit.
4. Connect lighting and small appliance circuits to the circuits that are left in fuse box using 15 amp. fuses
5. Turn on main electrical power.
6. Turn on all lights and appliances on each circuit and measure the amperage at the fuse box using an amp-probe meter. Do each branch circuit separately.
   NOTE: If the amperage of any branch circuit is greater than the amount listed on the fuse or the fuse blows out, the branch circuit must be divided into two circuits or part of the overloaded circuit can be put on another circuit.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures on overloaded circuits and read information on safety. See textbook pg. 256.

2. Read all information listed in Task# 408. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 409 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student shut off main electrical power before working on branch circuit wires?		
2. Did student install fuses with the correct amount of amperage?		
3. Did all fuses continue to work properly when all lights and appliances were turned on?		
4. Did student measure the amperage at fuse box correctly, doing each branch circuit separately?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 4
TOTAL POINTS POSSIBLE = 4

TASK# 408

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Match amp values of fuse to wire size of branch circuit

TASK NO: 409

STUDENT WILL: Check to see if value of fuse matches wire size of each branch circuit. If not, change fuse to proper size

GIVEN: An electrical wiring system with 15, 20, and 40 amp branch circuits.

TOOLS & EQUIPMENT: electrical wire gauge, screwdriver, pliers and flashlight

TASK STEPS:

1. Pull out or turn off main electrical disconnect on fuse box. (see textbook pg. 256).
   CAUTION: Always turn off electrical power before handling wires.
2. Remove fuse box cover.
3. Check each branch feeder wire, (main wire coming out of fuse box that feeds electrical power to appliances, lights, etc. on circuit), for correct wire size. Wire size should be printed on the wire insulation, use flashlight to locate.
4. If wire size cannot be read on wire insulation, measure with a wire gauge,
5. Using a wire gauge, measure the diameter of the bare (uncovered) part of end of wire. Fuse capacity should agree with wire. Fuse capacity should agree with wire size as shown below:

   15 amp fuse-#14 wire
   20 amp fuse-#12 wire
   40 amp fuse-# 8 wire
   60 amp fuse-# 4 wire

6. If fuse size does not agree with the above example, change fuse to proper size.
7. Reconnect any loose wires to fuse box connectors. Tighten well.
8. Replace fuse box cover.
9. Turn on main power.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was Electrical power turned off before removing fuse box cover?		
2. If any wire was disconnected from fuse box connectors, was wire reconnected when job was finished?		
3. Does the amp value of each fuse match the wire size?		
4. Was fuse box cover replaced?		
5. Was electrical power turned on after job was complete?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 409

LEARNING ACTIVITIES

1. Look at pictures of fuse box and different wire sizes. See your textbook pgs. 256 and 261.

2. Read all information listed in Task# 409. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 409 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTNANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install thin-wall steel tubing and outlet box

TASK NO: 410

STUDENT WILL: Install tubing and new electrical box (outlet)

GIVEN: A planned addition to an electrical system and a local building code requiring thin-wall steel tubing.

TOOL & EQUIPMENT: pencil, portable power drill, drill bits, hammer, screwdriver, chisel, adjustable wrench, hacksaw, tubing bender, measuring tools, 1/2 inch thin-wall steel tubing, electrical wiring, ground clip, wire nut, metal outlet box, box connectors, keyhole thin-wall tubing coupling, spackle, saw, nails, and safety glasses

TASK STEPS:

1. Put on safety glasses.
2. Turn off power.
3. Locate position on wall for electric box. (usually 12 inches from floor). See Information Sheet 410-1
4. Cut a small hole in wall to find the exact location of wall stud.
5. Position the electrical box against the hole in wall and
6. Cut along outline marks using a keyhole saw and a chisel over the stud. Be sure to cut screw hole opening. (see textbook pg. 265).
7. Measure length of tubing needed.
8. Using a pencil mark tubing at point where it would begin a right angle bend.
9. Position tubing bender on opposite side of mark and bend steel tubing away from the mark.
10. Drill a hole, which is a little larger than the diameter of tubing, up through 2 x 4 sole plate (stud located across bottom of wall) or down through top plate (stud located across the top of wall)
11. Put tubing into hole you just drilled, and position it so the end of tubing is flush to edge of opening for hole cut for electrical box.
12. Attach and tighten a box connector on end of tubing at hole opening. (see textbook pg.264)
13. Remove the electrical box knockout closest to the box connector. (see textbook pg. 260)
14. Push electrical box in opening cut for it, making sure box connector goes through the knock out hole.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 410

TASK STEPS:

15. Install lock nut and tighten against box using a screwdriver and hammer.
16. Center box bracket (see textbook pg. 265) on stud and attach bracket with lath nails or long roofing nails.
17. Fill area over the bracket with spackle so that it is flush with the wall surface.
18. Using another piece of tubing to connect to first tubing, you installed.
19. Mark second tubing at point where it would begin a right able bend to go up to next closest electrical box and bend with tubing bender.
20. Measure from bend to next closets box and cut tubing to correct length using a hacksaw.
21. Drill hole through 2 x 4 stud a little larger than box connector and in line with center of next closet electrical box.
22. Making sure power is off, remove outlet from this electrical box.
23. Remove electrical box knockout in line with connecting tubing.
24. Attach and tighten a box connector on end of tubing.
25. Remove lock washer and push tubing into box until box connector passes through hole in knockout.
26. Screw on and tighten locknut over connector using a screwdriver and hammer.
27. Attach and tighten a thin-wall tubing coupling where the two ends of tubing meet and tighten with an adjustable wrench.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Electrical and Electrical Basic

LEARNING ACTIVITIES

1. Look at pictures of outlet boxes (electrical boxes) and thin-wall tubing installation. See your textbook pgs. 261 and 265. Also see Information Sheet 410-1 in this guide.

2. Read all information listed in Task# 410. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 410 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

INFORMATION SHEET 410-1

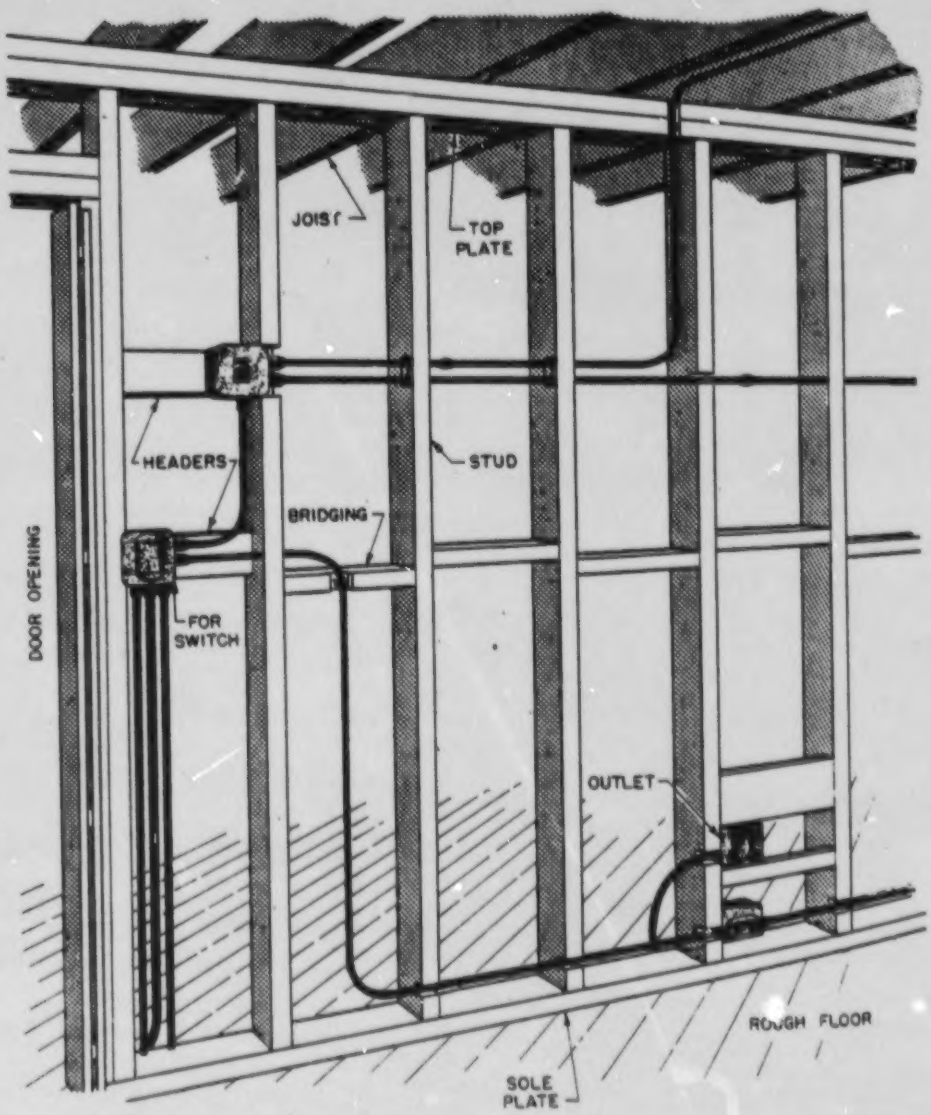
JOIST
TOP PLATE
HEADERS
STUD
BRIDGING
DOOR OPENING
FOR SWITCH
OUTLET
ROUGH FLOOR
SOLE PLATE

Fig. 19-5. This illustration shows the installation of thin-wall steel tubing in a wood studding partition wall. (Republic Steel Corp.)

Resource# 1
Electricity and Electronics Basics
William B. Steinberg & Walter Ford,
American Technical Society Ed., 1974
Pg. 212

Program	Task	Page
	410	1

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Pull wires through thin-wall tubing and connect wires to outlet receptacles

TASK NO: 411

STUDENT WILL: Pull wire through tubing from newly installed outlet to an existing outlet and connect wires to outlet receptacles

GIVEN: A new outlet with thin-wall tubing.

TOOLS & EQUIPMENT: wire fish tape, measuring tools, insulated wires, electrical tape, wire stripper, long-nose pliers, screwdriver, wire nuts, outlet receptacles, outlet covers

TASK STEPS:

1. Turn off electric power to connecting outlet.
2. Remove existing outlet receptacle. (see textbook pg. 262)
3. Feed (push) fish tape into tubing at newly installed outlet box until fish tape enters existing outlet box. (see textbok pg. 264)
4. Connect three wires of the correct size (one black, one white, and one green or red) to hook connection at the end of fish tape.
5. Wrap (cover)electrical tape over wires on hook connection of fish tape.
6. Pull wires down into the tubing by pull on opposite end of fish tape until at least 6 inches of the wires come through the new outlet box.
7. Remove wires from fish tape and cut wires at other outlet box so that at least 6 inches of the wires are hanging out of this outlet box, too.
8. Remove one inch of insulation from both ends of each wire using stripper (see textbook pg. 261).
9. Bend the end of each wire and connect to the screw terminal of the outlet receptacles. (see textbook pg. 263 for picture of process). Connect white wires to white screws, black wires to brass screws and green wires to green screws (grounding wire).
10. Push extra wire into each box, push outlet receptacles back into position and tighten receptacle screws.
11. Position and tighten receptacle covers over receptacles.
12. Turn on electrical power to outlets.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and equipment you will use to do this task. See textbook pg. 261 to 265.
2. Read all information listed in Task# 411. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 411 correctly.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEM TO BE CHECKED	RATING	
	YES	NO
1. Did student turn off electric power before starting job?		
2. Are the wires of proper size?		
3. Are the wires the correct colors?		
4. Was the correct length of wire left for each receptacle connection?		
5. Did student connect wires correctly to screw terminals of outlet receptacles?		
6. Were receptacles fitted back into electrical boxes correctly?		
7. Was power turned on after job was completed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 411

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install armored BX cable (metallic sheathed cable)

TASK NO: 412

STUDENT WILL: Replace damaged armored cable

GIVEN: An electrical circuit with damaged armored cable.

TOOLS & EQUIPMENT: measuring tools, channel lock pliers, hacksaw with fine tooth blade, wire stripper, insulating fiber bushing, armor cable box connectors, needle nose pliers, hammer, screwdriver, and safety glasses

TASK STEPS:

1. Put on saftey glasses
2. Shut off power to electrical circuit.
3. Measure length of BX cable needed. Add an extra 12 inches for fitting wire connectors.
4. Cut about 6 inches of armor covering using hacksaw, (see textbook pg. 261). Be careful not to cut into wires.
5. Hold armor cable with channel lock pliers, twist, and pull off cut section of armor covering.
6. Push into end of armor cable the insulating fiber bushing.
7. Remove 1 inch of insulation from ends of each wire. Using a wire stripper.
8. Bend back the bare grounding wire and attach armor cable box connectors over end of armor covering. (see pg. 61).
9. Remove locknuts from box connector fit armor cable connectors into box knockout holes and tighten locknuts.
10. Form a loop (fold) on ends of wires and attach wires to outlet receptacles, (see textbook pg. 262). Attach receptacles to electrical box. HOTE: Attach any white wires to white screws, black wires to brass screws, and ground wires to green screws.
11. Secure electric box in position on wall as indicated.
12. Turn on power to electric circuit.

EVLUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of BX cable and process for installing cable. See your textbook pg. 261.
2. Read all information listed in Task# 412. See Competency Sheet in this guide.
3. Ask teacher to demonstrate the task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 412 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student wear safety glasses?		
2. Did student shut off power to electric circuit before starting job?		
3. Was armor covering on cable cut with no damage to wires inside?		
4. Was insulating fiber bushing installed into end of cable?		
5. Were grounding wire and cable connector attached correctly to armor cable?		
6. Were locknuts tightened securely?		
7. Were all wires connected correctly to outlet receptacles?		
8. Were outlet receptacles attached securely to electrical box?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 412

COMPETENCY SHHET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Replace romex cable (nonmetallic sheathed cable)

TASK NO: 413

STUDENT WILL: Replace a damagaed cable with a new one

GIVEN: An electrical circuit with damaged cable.

TOOLS & EQUIPMENT: utility knife, wire stripper, romex box connectors, hammer, screwdriver, needle nose pliers and electrical pliers

TASK STEPS:

1. Shut off power to electrical circuit.
2. Measure and cut new cable to proper length. Add an extra 12 inches for fitting wire connectors.
3. Using a utility knife, cut off 6 inches of cable sheathing (cover on wire) from each end of cable. NOTE: Be careful no to cut into wires.
4. Remove any wrapping that maybe on wire.
5. Remove 1 inch of insulation from the ends of each wire using a wire stripper.
6. Install and tighten a romex box connector over the end of the cable sheathing.
7. Remove locknuts from box connectors.
8. Fit connectors into box knockout holes and tighten lock nuts.
9. Make a loop on end of wire and attach wore to outlet receptacles, (white wires to white screws, black wires to brass screws and ground wires to green colored screws.
10. Attach receptacles to electric box as indicated.
11. Secure electric box on wall as indicated.
12. Turn on power to electric circuit.

EVALUATION: **Student Evaluation Checklist.** Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

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LEARNING ACTIVITIES

1. Look at pictures of task and process for installing romex cable. See textbook pg. 261.
2. Read all informatin listed in Task# 413. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 413 correctly. See student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was power to electrical circuit shut off?		
2. Was cable sheathing removed with no damage to wires?		
3. Was box connector attached correctly to cable?		
4. Were wires attached correctly to outlet receptacles?		
5. Were outlet receptacles attached correctly to electrical box?		
6. Was electrical positioned correctly on wall?		
7. Was power to electrical circuit turned on when job was completed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 413

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install electrical grounding wires

TASK NO: 414

STUDENT WILL: Install electrical grounding wires on outlet receptacle and metal housing of appliance

GIVEN: A outlet receptacle and appliance that need grounding.

TOOLS & EQUIPMENT: screwdriver, adjustable wrench, 3 wire appliance cord, 1 amp setter, grounding wire, pipe ground clamp, wire stripper, pliers and wire nuts

TASK STEPS:

1. Test outlet receptacle for grounding by connecting a lamp tester from hot side of line to center screw on receptacle plate. (see textbook pg. 257)
2. If outlet receptacle is grounded, replace the two wire appliance cord with a three wire appliance cord. (see textbook pg. 259)
   NOTE: Make sure appliances cord is unplugged from wall.
3. Attach ground wire (green color) to the metal housing of appliance at a practical location.
4. Shut off power to electrical circuit.
5. Replace ungrounded outlet receptacle with grounded receptacle and fasten ground terminal to metal box. (see textbook pg. 262)
6. If a grounded receptacle is not available, attach a separate ground wire to the metal frame of appliance and to a cold water pipe using a ground clamp. (see textbook pg. 263)
7. Turn on power to electrical circuit.
8. Check metal housing of appliance for grounding. Use a lamp tester connected to hot wire and metal frame of appliance. Make sure cord on appliance in plugged into wall outlet.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of tools and process you will use to do this task. See your textbook pgs. 257, 261, 262, 274, and 275.

2. Read all information listed in Task# 414. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 414 correctly. Give Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was power to electrical circuit shut off before work started on electrical wires?		
2. Was outlet receptacle grounded properly?		
3. If needed, was separate ground wire connected properly?		
4. Was appliance cord unplugged before work started on wires?		
5. Did check with lamp tester indicate appliance housing is grounded?		

TOTAL POINTS EARNED =

POINTS NEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 414

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Identify A.C. Single-phase and A.C. Three-phase voltage circuits

TASK NO: 415

STUDENT WILL: Use an A.C. voltmeter to identify Single-phase and Three-phase circuits

GIVEN: Given A.C. electrical supplies of both Single-phase and Three-phase circuits, tools and equipment.

TOOLS & EQUIPMENT: A.C. voltmeter test leads and A.C. electrical supplies of both Single-phase and Three-phase and Three-phase circuits

TASK STEPS:

1. Pull out main disconnector or turn main circuit breaker to the off position.
2. Remove or open circuit box cover.
3. Look at the color of main lead wires coming into box. If they are colored black-red-white, the electrical supply is probably 220 volts-Single-phase.
4. Using the voltmeter, measure voltage across the two ungrounded wire which are colored black and black or black and red.
5. Using the voltmeter, measure voltage from ungrounded wire and grounded wire which are colored black and white red and white. Voltage is probably 110 volts. If voltages are 220 and 110 volts then the electrical supply is Single-phase.
6. If three electrical supply wires are colored red-red-red black-black-black this is probably a Three-phase electrical supply
7. Using a voltmeter, measure voltage from one wire to ground. Voltage is probably 20 volts.
8. Measure voltage from any two of the wires. Voltage is probably 440 volts. If voltages are 440 and 220 volts and no wires are colored white or green, the electrical supply is Three-phase.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Read information on "grounded wiring". See your textbook pg. 257. Also, look at pictures and information on Single-phase and Three-phase circuits. See Information Sheets 415-1 and 415-2 in this guide.
2. Read all information listed in Task# 415. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 415 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	RATING NO
1. Did student pull out main disconnector or turn off main circuit breaker before opening circuit box?		
2. Can student identify the color of main lead wires coming into box?		
3. Was voltmeter used correctly?		
4. Can student identify Single-phase from Three-phase circuits using the A.C. voltmenter?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 415

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INFORMATION SHEET 415-1

Alternating Current and Motors. Alternating current as discussed up to this point is "single-phase" alternating current. In foreign countries it is frequently designated "monophasic" current. When applied to a motor, remember that it magnetizes the steel poles of the motor every time it builds up from zero to peak voltage, or in other words 120 times per second, as shown in Fig. 3-3, which shows three consecutive cycles of 60-cycle current. At the top is indicated the time between cycles, or 1/60 sec. At the bottom is indicated the time between alternations, or 1/120 sec. One might say that the motor is given a push 120 times a second, just as a gasoline engine is given a push every time there is an explosion in the cylinder. Offhand, 120 times per second may seem fast enough for any purpose, but remember that an ordinary motor runs at 1,800 rpm, which means that the rotor (the rotating part) makes 30 revolutions every second. In turn this means that the 120 pushes per second become only 4 pushes per revolution; if the motor is a large one, the rotor or armature may be 12 in. in diameter, over 36 in. in circumference, which in turn means that a point on the rotor has to turn about 9 in. between pushes. Do not imagine that these pushes are abrupt sudden impacts. They are gradual pushes that start slowly and build up to a maximum as the voltage builds up to a maximum value.

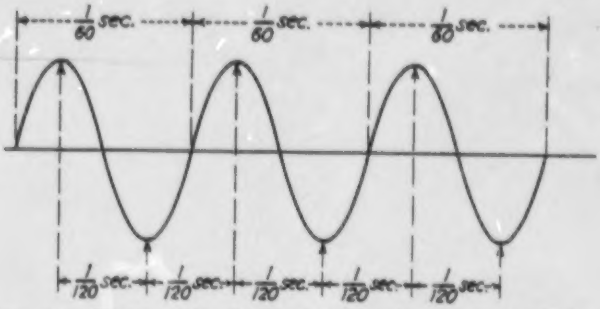

Fig. 3-3 Three cycles of 60-cycle alternating current. All the changes shown take place in 3/60 or 1/20 sec.

Single-phase alternating current.

Resource# 1
Electricity and Electronics Basics
William B. Steinberg & Walter Ford

Program	Task	Page
	415	1

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INFORMATION SHEET 415-2

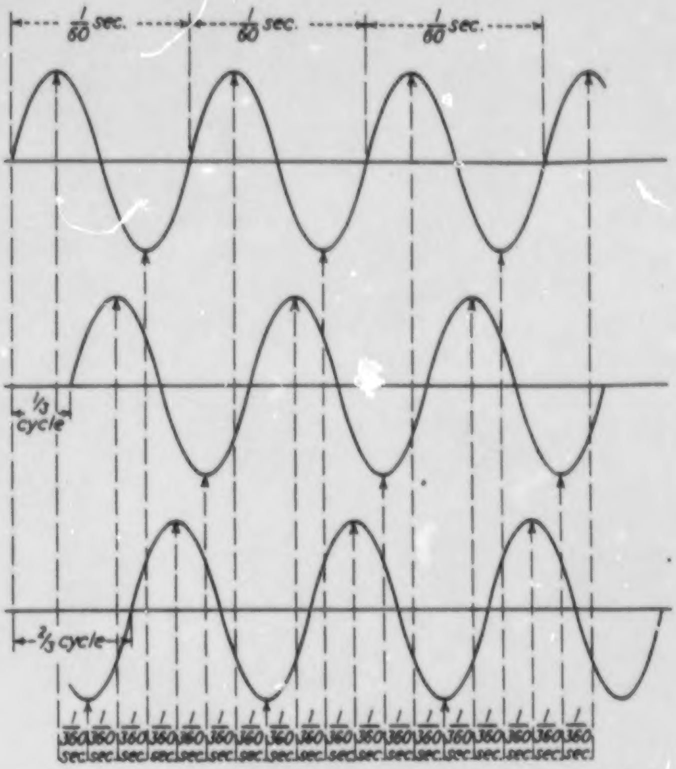


Fig. 3-4 Three separate single-phase currents combine to form 3-phase current.

Three-phase Alternating Current. It can be done by putting into the motor three separate windings not connected to each other in any way, but each connected to one of three separate sources of single-phase alternating current. The three separate sources of current must be so designed that the peak voltage of one does not coincide with the peak voltage of another. The voltages in the three sources come to their peaks in very regular fashion, one after the other. Then the motor receives three times as many pushes as before. Figure 3-4 shows the voltage curves of the three separate sources. At the top is indicated the time between cycles *in each separate source:* 1/60 sec. At the bottom is indicated the time between pushes *from three separate sources combined:* 1/360 sec. That is 3-phase current, and it is nothing more or less than three separate sources of single-phase alternating current so arranged that the peaks of voltage follow each other in a regular, repeating pattern.

Do note that for each phase, the duration of a cycle is 1/60 sec, but there are two pushes per cycle, so that the time between pushes is 1/120 sec. But look at the bottom of the diagram and you will see that the pushes from the three phases combined are only 1/360 sec apart. The pushes are imparted by each of the three windings in turn, as shown by the dotted lines from the peaks to the bottom of the diagram.

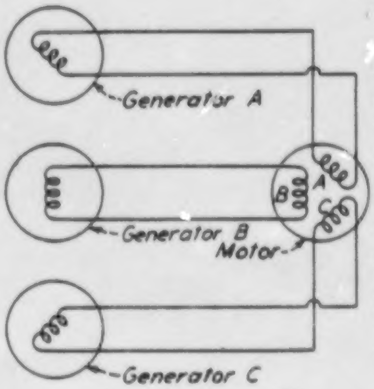


Fig. 3-5 Three single-phase generators **form a 3-phase** circuit, here connected to a 3-phase motor.

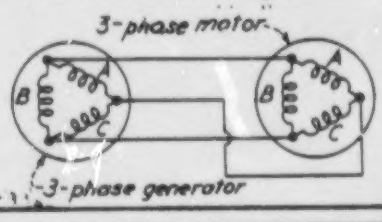


Fig. 3-6 The three separate single-phase generators of Fig. 3-5 have now been combined into one 3-phase generator. Only three wires are used instead of six.

Resource# 1 (CONTINUED)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install a light switch

TASK NO: 416

STUDENT WILL: Install a single pole lights switch

GIVEN: A light that needs to be controlled by a single pole light switch.

TOOLS & EQUIPMENT: electrical cable, switch boxes, single pole light switch, 2 box connectors, screwdriver, hammer, wire nuts, continuity tester, keyhole saw, wire stripper, long-nose pliers, portable drill and bits, black paint or black electrical tape, safety glasses

TASK STEPS: (Power source from light to switch)

1. Put on safety glasses.
2. Shut off power on this circuit.
3. Install a switch box at location of switch.
4. Run a two wire cable to switch box. Connect each wire to a terminal on switch, (see textbook pg. 268.)
5. Paint the end of white wire black or cover end with piece of black electrical tape.
6. Connect ground wires together using a wire nut.
7. Connect black circuit wire to black switch wire at light using a wire nut.
   NOTE: Be sure electrical power to circuits is turned off.
8. Connect white circuit wire to white terminal at light and white switch wire to brass terminal at light.
9. Paint end of white switch wire black or cover with black electrical tape.
10. Connect ground wires together using a wire nut.
11. Check switch wires by using a continuity tester.
12. Turn on power to circuit and test switch by turning on light.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook Complete Do-it-Yourself Manual

LEARNING ACTIVITES

1. Look at pictures of wiring for a single light switch. See textbook pg. 268.

2. Read all information listed in task# 416. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 416 correctly. See Student Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATON CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student wear safety glasses?		
2. Did student shut off electrical power?		
3. Was switch box installed correctly?		
4. Was cable connected correctly at switch box and at light?		
5. Was check of switch wires with continuity tester satisfactory?		
6. Were ends of white wires covered with black paint or black electrical tape?		
7. Did student test switch by turning on light?		
8. Was electrical power turned on just before testing switch?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 416

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install 3-way and 4-way light switches

TASK NO: 417

STUDENT WILL: Install two 3-way switches and one 4-way switch in room

GIVEN: A light that needs to be controlled at three different locations in room.

TOOLS & EQUIPMENT: two 3-way switches, one 4-way switch, 2 wire and 3 wire electrical cable, 6 box connector, 3 switch boxes, keyhole saw, screwdriver, hammer, continuity tester, long-nose pliers, portable powered drill and bits, lamp tester, safety glasses, and wire nuts

TASK STEPS:

1. Put on safety glasses.
2. Remove fuse from light circuit.
3. Remove light fixture from electrical box.
4. Check wires at light with lamp tester to be sure power is off.
5. Run a 2-wire electrical cable from electrical box at light to closest switch box.
6. Run a 3-wire cable from first 3-way switch box to second box (4-way switch box), to third box (3-way switch box).
7. At first switch, connect black wire from the 2-wire cable on side of switch that has only one screw terminal.
8. Connect red wire from 3 wire cable to top screw terminal on other side of first switch, (3-way switch).
9. Connect black wire from 3 wire cable to last screw terminal bottom side of first switch.
10. Connect two white wires together at first switch using a wire nut then paint ends of these wire black.
11. Using wires from first switch, connect red wire to top screw termianl and black wire to lower terminal on same side of second switch (4-way switch).
12. Using wires from third switch box, connect the red wire to top screw terminal and black wire to lower screw terminal at other side of second switch.
13. Connect two white wires together at second box using a wire nut then paint ends of wire black.
14. Using wires from second switch connect red wire to top screw terminal and black wire to lower screw terminal on same side of third switch.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PJROGRAM
(CONTINUED)

TASK NO: 417

TASK STEPS:

15. Connect white wire to single screw terminal on other side of third switch and paint end of wire black.
16. At light fixture, connect two black wires together using a wire nut.
17. Connect white feed to white screw terminal on light fixture. Paint the end of this wire black.
18. Test all switch wires with a continuity tester.
19. Put fuse back into this circuit and test switches by operating each switch.

EVALUATION: Student Evaluation Checklist. Must score satisfactory each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of 3-way and 4-way switch connections. See textbook pgs. 268 and 269, also see Information Sheets 417-1 and 417-2 in this guide.

2. Read all information listed in Task# 417. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 417 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher tp check.

STUDENT EVALUATON CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student wear safety glasses?		
2. Was fuse removed from light circuit?		
3. Were wires painted correctly?		
4. Was each wire connection installed correctly?		
5. Were all cables connected properly to electrical boxes?		
6. Was check of switch wires with continuity tester satisfactory?		
7. Was power returned to circuit?		
8. Do all switches operate light fixture properly?		

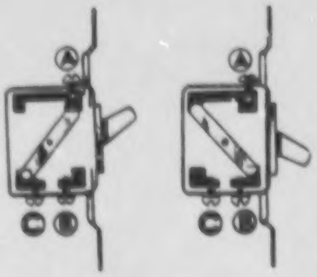
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 417

known as the "3-way" type are used. Despite their name, they will not control a light from three different places, but only two. Such switches have three different terminals for wires, and their internal construction is similar to that shown in Fig. 6-13. In one position of the handle, terminal *A* is connected inside the switch to terminal *B*; in the other position of the handle, terminal *A* is connected to terminal *C*. *The common terminal A is usually identified by being of a darker color than the others, which are natural brass.*

Fig. 6-13. This shows what happens inside a 3-way switch when the handle is thrown from one position to another. The current enters by the "common" terminal A, leaves by either B or C depending on the position of the handle.



Study the diagram of Fig. 6-14, in which the handles of both switches are down. The current can be traced from SOURCE over the black wire through switch No. 1 through terminal *A*, out through terminal *B* and up to terminal *C* of switch No. 2, but there it stops. The light is out.

Next see Fig. 6-15 where the handles of both switches are up. The current can be traced from SOURCE over the black wire through switch No. 1 through terminal *A*, as before, but this time out through terminal *C*, and from there up to terminal *B* of switch No. 2. There it stops and the light is out.

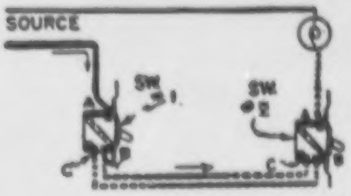


Fig. 6-14. A light controlled by two 3-way switches. With both handles down, the light is out.

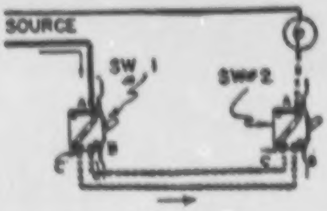


Fig. 6-15. With the handles of both switches up, the light is still out.

Now examine the diagrams of Fig. 6-16 and 6-17, in both of which the handle of one switch is up, the other down. In each case, the current can be traced from SOURCE over the black wire, through both switches, through the lamp, and back to SOURCE. The light in either case is on. In the case of either Fig. 6-16 or 6-17, throwing either switch to the opposite position changes the diagram back to either Fig. 6-14 or 6-15, and the light is out. In other words, the light can be turned on and off from either switch.

Resource# 1
Wiring Simplified - H.P.
Richter and W.C. Schwan,
Park publishing, Inc. Ed,. 1981

CIRCUIT BASICS

The wiring is simple, as these diagrams show. Run the white wire from SOURCE as usual to the light to be controlled. Run the black wire from SOURCE to the common or marked terminal of the *first* 3-way switch. Run a black wire from the common or marked terminal of the *second* 3-way switch to the light. That leaves two unused terminals on each switch; run two black wires from the terminals of the first switch, to the two terminals of the second switch. It makes no difference whether you run a wire from *B* of the first switch to *C* of the second as shown, or from *B* of the first to *B* of the second. The wires that start at one switch and end at another are called runners, travelers, or jockey legs.

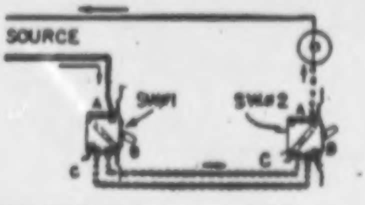


Fig. 6-16. With one handle up, the other down, the light is now on. Trace the current along the arrows.

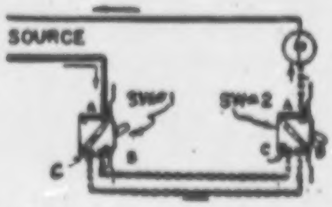


Fig. 6-17. Both handles are now the opposite of Fig. 6-16, but the light is still on. Either switch controls it.

4-way Switches: If a light is to be controlled from more than two points, use two 3-way switches, and 4-way switches at each remaining point, whether there are three, four or more points in total. A 4-way switch can be identified by the fact that it has four terminal screws and *no* "on"-"off" markings on the handle. Install the 3-way switches at the points nearest the SOURCE and nearest the light, with 4-way switches in between, all as shown in Fig. 6-18.

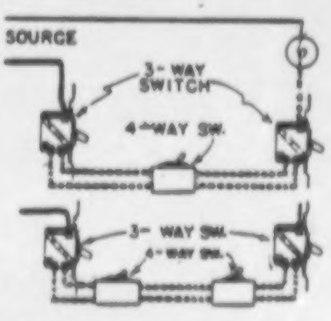


Fig. 6-18. Usually four-way switches are connected as shown above.

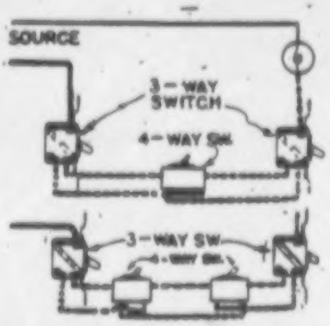


Fig. 6-19. Some brands of 4-way switches are connected as shown above.

Different brands of 4-way switches are made in two different ways, so that sometimes the diagram of Fig. 6-18 is not correct, and you must use that of Fig. 6-19 instead. If you are not sure of the type you have, try one diagram; if it does not work, try the other. You can do no harm by wrong connections, except that the circuit will not work if you have the wrong connection.

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Install electrical outlet on finished wall

TASK NO: 418

STUDENT WILL: Put in an extra outlet on a finished wall

GIVEN: A finished wall that needs an extra outlet.

TOOLS & EQUIPMENT: safety glasses, hammer, 6d finished nails nail set, pry bar, portable drill and bits, key hole saw, pencil, electrical box, outlet, box connectors, 2 wire electrical cable, wire stripper, long-nose pliers

TASK STEPS:

1. Put on safety glasses.
2. Locate and mark position of new outlet box. Stay at least 3 inches away from wall stud.
3. Remove baseboard shoe moldings where electrical cable is going to be installed.
4. Cut hole for new outlet box.
5. At bottom of wall and below for new outlet box, drill a hole at a 45 angle through the plaster and 2 x 4 bottom sole plate, make sure hole is large enough for the electrical cable.
6. Run wire up from this hole to outlet box hloe and pull about 6 inches of cable through outlet box opening.
7. Cut away plaster along the bottom of wall to connecting wall outlet. Make sure cut is made wide eonugh for electrical cable to fit inside.
8. At bottom of wall and below connecting outlet, drill a hole through the plaster and 2 x 4 sole plate. Make sure hole is large eonugh for the electrical cable.
9. Shut off electrical power from connecting outlet and remove outlet receptacle.
10. Remove a knockout from bottom of box.
11. Remove about 6 inches of insulation from end of electrical cable using wire stripper. Be careful not to cut into wires.
12. Attach a box connector on the end of the electrical cable sheathing (insulation) and run cable up behind wall until the cable comes through the box knockout hole.
13. Attach and tighten box connector locknut.
14. Connect white cable wire to white screw terminal, black, wire to brass screw terminal, and ground wire to ground terminal.

(continued on next page)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 418

TASK STEPS:

15. Replace outlet receptacle and cover.
16. Install box connector on cable at new outlet and attach to box.
17. Push box into hole and screw to wall.
18. Connect cable wires to new outlet receptacles and attach outlet receptacle to box.
19. Turn on electrical power to circuit and test new outlet receptacles.
20. Replace baseboard and shoe moldings.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of installation of wiring for wall outlets. See textbook pgs. 261, 264, and 265.

2. Read all information listed in Task# 418. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and folow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 418 correctly. See student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student wear safety glasses?		
2. Did student cut electrical power from circuit before working on connecting outlet?		
3. Were box connectors installed correctly?		
4. Were wires at outlet receptacles connected properly?		
5. Does new outlet receptacle operate properly?		
6. Did student replace baseboard and shoe moldings?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 418

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Replace fluorescent light ballast

TASK NO: 419

STUDENT WILL: Replace ballast (see textbook pg. 274), on fluorescent light

GIVEN: A fluorescent fixture with tubes and starter replaced, but light does not go on.

TOOLS & EQUIPMENT: screwdriver, wire stripper, wire nuts, fluorescent ballast

TASK STEPS:

1. Turn off power to fluorescent light.
2. Remove light deflector and fluorescent tubes.
3. Remove wore nuts at ballast wires.
4. Remove old ballast from light fixture. Look at how wire color are connected.
5. Install new ballast of same kind and voltage as old ballast.
6. Connect wires of the same color using wire nuts follow wiring example in your textbook pg. 274.
7. Replace fluorescent tubes and light deflector.
8. Turn on power and test light.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of wiring for fluorescent ballast. See your textbook pg. 274.
2. Read all information listed in Task# 419. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 419 correctly. See student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was electrical power to light fixture turned off?		
2. Were all wire nut connection tight?		
3. Was the correct type of ballast installed?		
4. Were fluorescent tubes and light deflector installed correctly?		
5. Was power turned on again after job was completed?		
6. Did light work when tested?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 419

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Test electrical circuit for electrical continuity (unbroken connection of electrical power)

TASK NO: 420

STUDENT WILL: Test wires on an electrical circuit for electrical continuity

GIVEN: An electrical circuit.

TOOLS & EQUIPMENT: V.O.M. test meter and test probe

TASK STEPS:

1. Shut off electrical power to circuit being tested.
2. Attach black, test lead wire in v.o.m. meter or "common" jack.
3. Attach red, test lead wire in v.o.m. meter "+" jack.
4. Set "function" switch, (if there is one), on meter to D.C. position.
5. Set "selector" switch to R x 1 scale.
6. Connect ends of test, lead wires together and adjust "ohms" knob (round handle) so that meter hand indicates "o" (zero) on the ohms scale.
7. Disconnect lead wires.
8. Connect one lead wire to one end of circuit wire and the other lead wire to other end of circuit wire.
9. Check meter hand. If hand indicates zero ohms, then wires have continuity.
10. Repeat same process for other circuit wires.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it Yourself Manual

LEARNING ACTIVITIES

1. Look at picture and read description on V.O.M. meter. See Information Sheet 420-1 in this guide.
2. Read all information listed in Task# 420. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 420 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student shut off power to circuit before starting task?		
2. Were black and red lead wires connected properly to v.o.m. meter?		
3. Were switches on meter set correctly?		
4. Was ohms knob adjusted correctly?		
5. Were lead wires connected to ends of circuit wire correctly?		

TOTAL POINTS EARNED =

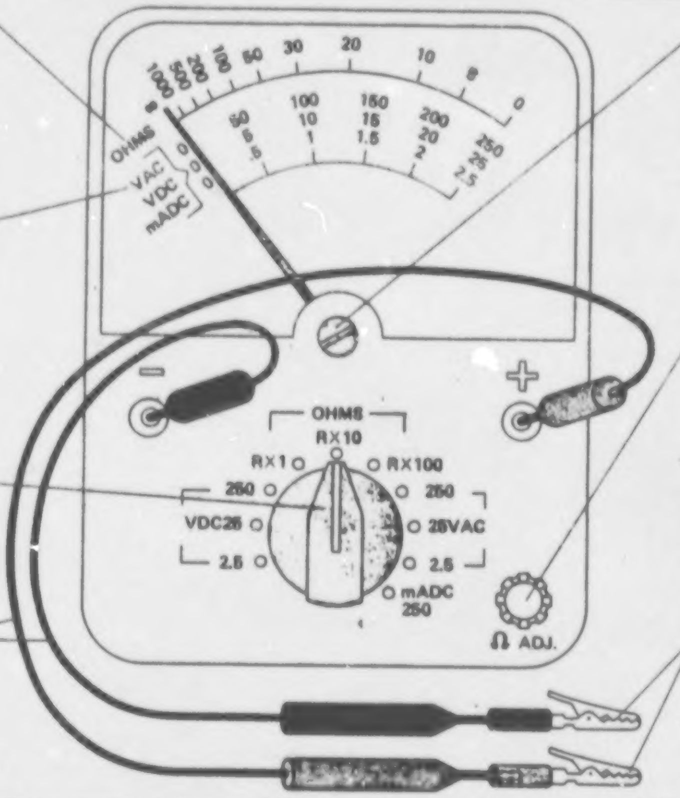
POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 420

BEST COPY AVAILABLE

INFORMATION SHEET 420-1

ying and using a volt-ohm meter



Ohms scale: Low ohms readings are at right, high at left – the reverse of other scales. Multiply ohms reading by whatever number selector switch indicates (RX10 or RX100). Symbol at left (∞) stands for infinity. When needle points to it, ohms reading is higher than meter can measure

VAC, VDC, and mADC scales: Read here for volts AC, volts DC, or milliamps DC (thousandths of an ampere). Selector switch shows which set of numbers to use: top, middle, or bottom. When measuring unknown voltages, start with selector on the highest scale (250) and work down to achieve increased sensitivity and accuracy

Selector switch: Rotate switch so that it points to quantity you want to measure. Instead of selector switch, some low-priced meters have an array of jacks, each one corresponding to a different measurement

Test leads and jacks: Always insert black lead in − jack, red lead in + jack (− jack is also called com or common). When testing a battery or other DC voltage source, apply the black probe to negative terminal, red probe to positive terminal

Pointer adjustment: Remove both probes from their jacks and check position of needle. It should point to zero volts. If it does not, turn pointer adjustment screw so that it does. If needle cannot be adjusted, meter is broken and should be sent to factory for repair

Ohms adjustment knob: Each time you turn the selector to an ohms position from another position, you must zero-adjust the ohms scale. Plug test leads into their jacks, hold or clip their probe ends firmly together, and turn Ω *ADJ* knob until needle reads zero ohms. Greek letter omega (Ω), is the symbol for ohms

Test probes: In order to get correct readings on the volt-ohm meter, both probes must make firm electrical contact at the test points. Alligator type probes usually do this best; they also free your hands for manipulating parts during test. Needle-type probes may be required to get into tight spots or make contact with very small terminals. You can get alligator probes that slip over needle probes (as shown), or use two pairs of test leads—one with alligator probes, the other with needle probes

Ohm tests for continuity and resistance

The first step in an ohm test is simple but vital: Completely disconnect the appliance or part being checked from any supply of electricity. Remember that turning the appliance off is not enough; its power cord must be pulled from the outlet. If you fail to do this, you are likely to destroy your volt-ohm meter and you risk receiving a serious electric shock.

Next, set the meter's selector switch to one of the ohms positions. The choice of positions depends on what you are looking for. If you are measuring resistance, you will probably use the RX1 scale, since most appliance parts have fairly low resistances. To test for grounding or short circuits, however, you will generally set the meter to the highest position available—RX100 for the meter illustrated on page 124, up to RX1,000,000 on other meters. Once the selector is set, zero-adjust the ohms scale (see p.124).

To make the test, apply the probes of the meter to the electrical terminals of the part being checked—for example, the prongs of a plug, the terminals of a switch, the leads from a motor's field coil, or the ends of a heating element.

There are two types of ohms tests: continuity and resistance. In a continuity test, you simply want to find out whether or not an electrical pathway exists through a particular component. Tests for open circuits, short circuits, and grounding are examples. In a resistance test you are looking for detailed information on the electrical condition of a part by checking its resistance.

For both types of test, it is important that the probes make good contact with the part being tested. They should touch bare wire or metal, not insulation, paint, corrosion, or dirt. Alligator clips give firmer contact than needle probes; use them where possible. Also, it is good practice to manipulate wires especially when you are testing for open circuits, short circuits, and grounding. By twisting, tugging, and pulling on a wire, you will help uncover weak connections.

Rescurce# 1
Fix-it Yourself Manual-Readers Digest, 1st Ed,. 1977, pg. 124

Program	Task	Page
	420	1

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Test electrical circuit for resistance value

TASK NO: 421

STUDENT WILL: Test for resistance value (amount of resistance) of components on an electrical circuit

GIVEN: An electrical circuit with resistance components.

TOOLS & EQUIPMENT: V.O.M. test meter and test probe

TASK STEPS:

1. Shut off electrical power to circuit.
2. Connect test probes to V.O.M. meter.
3. Set "function" switch to D.C. position.
4. Set "selector" switch to R x 1, R x 100, or R x 1000 scale.
5. Adjust meter to zero.
6. Connect one test lead wire to one terminal of resistance component and other lead to other component terminal.
7. Read resistance value on ohms scale. If value is too high or too low, choose another position on scale. Adjust meter to zero after selecting each position on scale.
8. Test resistance of other resistance components in the circuit.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Electricity and Electronics Basic Fix-it-Yourself Manual- Readers Digest, 1st Ed., 1977 pg. 125

LEARNING ACTIVITIES

1. Look at picture on calculating resistance. See Information Sheet 421-1 in this guide.

2. Read all information listed in Task# 421. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 421 correctly. See Student Evaluation Checklist in this guide.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student shut off electrical power to circuit?		
2. Were test lead wires connected properly to terminals of resistance components?		
3. Were "function" and "selector" switches set correctly?		
4. Was meter adjusted to zero after selecting each change of position on scale?		
5. Was resistance testing of other components on circuit done correctly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 421

INFORMATION SHEET421-1

Calculating Resistance

Ohm's law can be used to calculate the resistance in a circuit if the voltage and the current are known. The formula for calculating resistance is:

Resistance is equal to voltage divided by the current.

$$\text{Resistance (ohms)} = \frac{\text{Voltage (volts)}}{\text{Current (amperes)}}$$

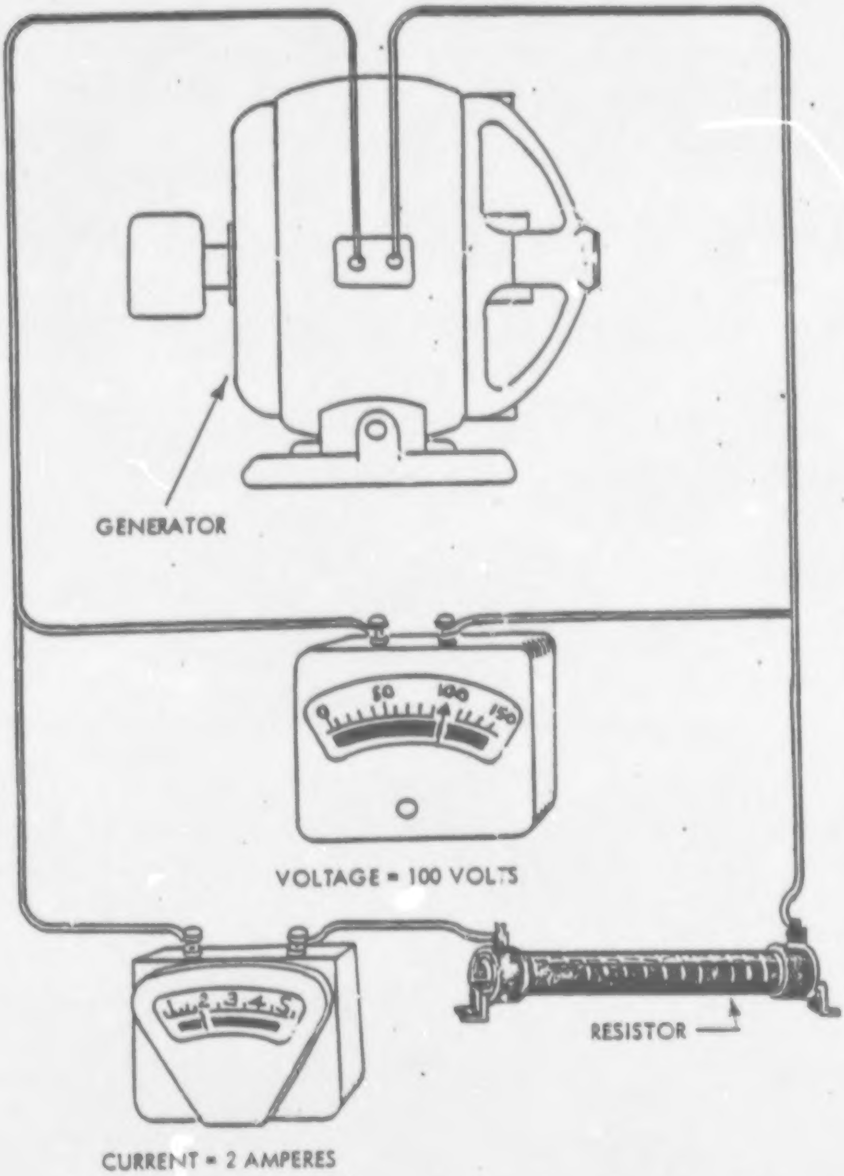

GENERATOR
0
50
100
150
VOLTAGE = 100 VOLTS
RESISTOR
1
2
3
4
5
CURRENT = 2 AMPERES

Fig. 14-4. The generator is producing 100 volts and 2 amperes of current is flowing through the resistor.

Resource# 1

Electricity and Electronics Basics William B. Steinberg and Walter Ford, American Tech. Society

Program	Task	Page
	421	1

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENAANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Measure voltage of a circuit

TASK NO: 422

STUDENT WILL: Measure voltage of a circuit using v.o.m. meter

GIVEN: An energized (charged) electrical circuit.

TOOLS & EQUIPMENT: V.O.M. test meter and test leads

TASK STEPS:

1. Shut off electrical power to circuit.
2. Connect the test lead to hot side of circuit.
3. Connect black test lead to ground side of circuit.
4. Set "function" switch to A.C. for A.C. circuits and D.C. for D.C. circuits.
5. Set "selector" switch to voltage scale higher than estimated voltage of circuit.
6. Return electrical power to circuit and read voltage value.
7. Shut off electrical power to circuit again.
8. Remove meter test leads from the circuit.
9. Repeat the same process to test voltage in other parts of the circuit.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it Yourself Manual
Electrical and Electronics Basic

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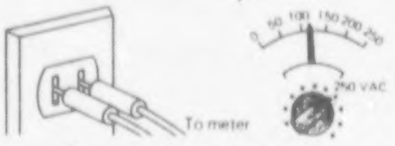
INFORMATION SHEET 422-1

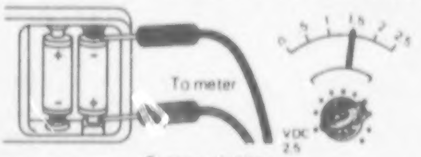
Voltage and current tests

A common test is for voltage at a 120-volt wall outlet. Since any voltage much higher than that of a 12-volt car battery is dangerous, you must be extremely careful. The safest procedure for a beginner is *to start by cutting off power to the outlet* by removing the fuse (or switching off the circuit breaker) that controls it. Set the volt-ohm meter to the 250 VAC scale and insert its needle probes into the slots of the wall receptacle. To get a reading, activate the outlet by replacing the fuse or throwing the circuit breaker on.



Checking the voltage at an outlet

A volt-ohm meter can also be used for checking a battery, but the battery should have an electrical load on it during the test. To test a 1.5-volt battery in a hand calculator, set the meter to the 2.5 VDC scale and touch the probes to the battery terminals (red probe to + and black to –). Then, turn the calculator on.



Testing a battery

If the voltage drops below 1.3 volts, the battery is probably bad.

Most volt-ohm meters can also be used to measure an electric current if it is a direct current (DC) and fairly small (less than ½ ampere). Some meters also permit testing of a small alternating current (AC). Others have a special attachment that allows you to test larger currents.

Calculating Voltage

Ohm's law can be used to determine the voltage being applied to a circuit provided the current and resistance are known. The formula for determining the voltage is:

Voltage = Current × Resistance

Using symbols $E = I \times R$

In the circuit in Fig. 14-3 the current is 5 amperes. The resistance is 6 ohms. What is the voltage of the generator?

$$E = I \times R$$
$$E = 5 \times 6$$
$$E = 30 \text{ volts}$$

The voltage of the generator is 30 volts.

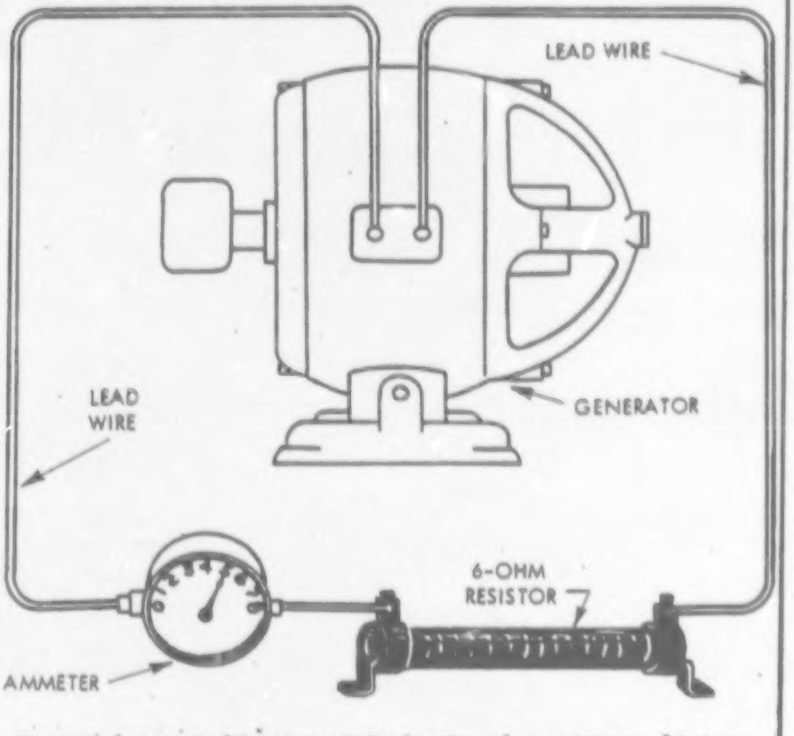


Fig. 14-3. A current of 5 amperes is flowing through a resistance of 6 ohms.

Resource# 1
Electricity and Electronics Basic-
William B. Steinberg & Walter Ford,
American Technical Society, Ed., 1974, pg. 135

Fix-it-Yourself Manual
Reader's Digest, 1st Ed., 1977

Program	Task	Page
	422	1

LEARNING ACTIVITIES

1. Look at pictures of equipment for voltage testing. See Information Sheet 422-1 in this guide.
2. Read all information listed in Task# 422. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 422 correctly. See Student Evaluation Checklist in this guide.
6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING
1. Did student shut off electrical power to circuit before starting task?	
2. Were v.o.m. test leads connected properly?	
3. Were the "function" an "selector" switches set properly?	
4. Did student read voltage values correctly?	
5. Did student shut off electrical power to circuit again, before removing meter test leads?	

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 422

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Measure the amperage flowing through a D.C. circuit

TASK NO: 423

STUDENT WILL: Measure the amperage flowing through a D.C. circuit of less than 10 amps (amperes)

GIVEN: An energized electrical circuit and equipment.

TOOLS & EQUIPMENT: V.O.M. test meter, test leads, screwdriver

TASK STEPS:

1. Shut off power to circuit.
2. Connect black test leads to V.O.M. common jack ("-"jack) and red test leads in the "+"jack.
3. Disconnect the circuit wires in which you are going to measure the electrical current.
4. Connect the V.O.M. meter in series with the circuit.
5. Set meter to the highest range (highest position 500 MA), then move to a lower range for a better reading of amperage.
6. Turn on power to circuit again and read the V.O.M. meter. If the V.O.M. needle moves in the wrong direction, turn the function switch to the opposite direction.
7. Turn off power to circuit.
8. Disconnect test leads.
9. Connect circuit wires again.
10. Turn on power to circuit.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it Yourself Manual
Electrical and Electronics Basic

LEARNING ACTIVITIES

1. Read new words that are going to be presented in this task. See Information Sheet 423-1 in this guide.

2. Read all information listed in Task# 423. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEP."

5. Fill-out checklist to see if you have completed Task# 423 correctly. See Student Evaluation Checklist in this guide.

6. Give completed Student Evaluation Checklist to teacher to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student shut off power to electrical circuit?		
2. Did student connect test leads correctly?		
3. Did student set range correctly on v.o.m. meter?		
4. Did student set function switch correctly?		
5. Did student connect v.o.m. meter in series with circuit?		
6. Was power to circuit turned on after test leads were pulled out?		
7. Was amperage read properly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 423

INFORMATION SHEET 423-1

STUDY WORDS:

energized	- charged with electricity
"___" jack	- also called "common" jack. It is a small hole located on v.o.m. meter into which a black lead wire is pushed in
range	- the horizontal distance between high and low readings on a v.o.m. meter scale
needle	- the hand on meter scale which is similar to hand on clock
series	- a group, a number of something with one coming after the other in a line
amps	- same as "amperes."

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Check amperage on an A.C. electrical appliance

TASK NO: 424

STUDENT WILL: Check the amperage on an A.C. electrical appliance when it is operating

GIVEN: An A.C. elctrical appliance, tools and equipment.

TOOLS & EQUIPMENT: clamp-on ammeter, test leads

TASK STEPS:

1. Turn off power to the circuit.
2. Remove cover on electric appliance to see wires.
3. Separate wires and attach ammeter clamp over an insulated part of the black wire to hold wire.
4. Set ammeter to a high amp range on scale.
5. Let ammeter hang by wire and turn power back on the circuit.
   NOTE: Do not touch ammeter when power is turned on.
6. Read the ammeter without touching it. If range on scale is to high, turn circuit power off, set scale to a lower range, turn circuit power on again, and read ammeter.
7. Turn circuit power off and remove the ammeter.
8. Replace cover on electrical appliance.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in task# 424. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency She[illegible] and follow instructions in "TASK STEPS."

4. Fill-out checklist to see if you have completed Task# 424 correctly. See Student Evaluation Checklist in this guide.

5. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student turn off power to circuit before working on wires?		
2. Did student attach ammeter clamp over insulated part of black wire?		
3. Did student read amperage correctly?		
4. Did student touch ammeter only when circuit power was off?		
5. Did student turn off circuit power before removing ammeter?		
6. Did student turn off circuit before putting on the cover of the electrical appliance?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 424

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Electrical Related Duties

JOB TASK: Test and trouble-shoot an A.C. motor

TASK NO: 425

STUDENT WILL: Test appliance motor, locate, and repair problem with an A.C. motor having less than one horsepower.

GIVEN: An A.C. motor with less than one horsepower engine, tools and equipment.

TOOLS & EQUIPMENT: V.O.M. meter, ammeter, test leads, screwdriver, small socket wrench set, hammer, pliers, appliance test cord with insulated clips on one end, emery cloth, lubicating oil, allen wrench set, small gear puller

TASK STEPS:

1. Disconnect appliance from outlet.
2. Remove motor from appliance.
3. Connect clips on appliance test cord to motor terminals.
4. Place an ammeter clamp over one of the small wires on one end of test cord.
5. Plug in appliance test cord at wall outlet and read amperage at starting and running positions, Also, listen for motor noises or vibrations, (shaking of motor).
6. Compare amperage at these positions with amperage printed on motor label.
   NOTE: Make sure test cord is disconnected from wall outlet before touching it.
7. With power disconnected, remove appliance test cord and ammeter.
8. Using gear puller, remove v-belt pulley. Be sure to loosen pulley set screws.
9. Remove four bolts on rear housing of motor and remove rear housing. Rotor can then be removed. (See Information Sheet 425-1).
10. Inspect rotor bearings at both ends of housings and rotor shaft to see if they are still in good condition.
11. Check centrifugal switch to see that it operates properly and that the centrifugal switch contacts, located at one end of housing, are not burned away, (See Information Sheet 425-1).
12. Clean switch contacts with emery cloth.
13. Measure resistance value of both running and starting windings.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 425

TASK STEPS:

14. Check motor winding continuity and ground to motor frame.
15. Check windings insulation for changes in color or possibly burned insulation.
16. Check all motor lead wires for good terminal connections, winding connections and insulation.
17. Clean inside parts of motor well and put together again. Make sure all washers are replaced on rotor shaft.
18. Tighten four bolts on rear housing evenly. Rotor should turn easily by hand.
19. Check amperage again as you did in step number 4 of this paper.
20. Compare new amperage values with original values from first amperage test.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it-Yourself Manual
Reader's Digest, 1st Ed., 1977, pg. 135.

LEARNING ACTIVITIES

1. Look at picture of motor and its parts. See Information Sheet 425-1 in this guide.
2. Read all information listed in Task# 425. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 425 correctly. See Student Evaluation Checklist in this guide.
6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student disconnect appliance from outlet before removing motor?		
2. Was appliance test cord connected to motor correctly?		
3. Were test vavles read correctly?		
4. Was motor taken apart correctly?		
5. Were all parts of motor inspected as indicated?		
6. Were parts of motor reconditioned as indicated?		
7. Was motor put back together correctly?		
8. Does rotor turn easily after tightening the four bolts?		
9. Do amperage values on test compare well with values on motor label?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9

TOTAL POINTS POSSIBLE = 9

TASK# 425

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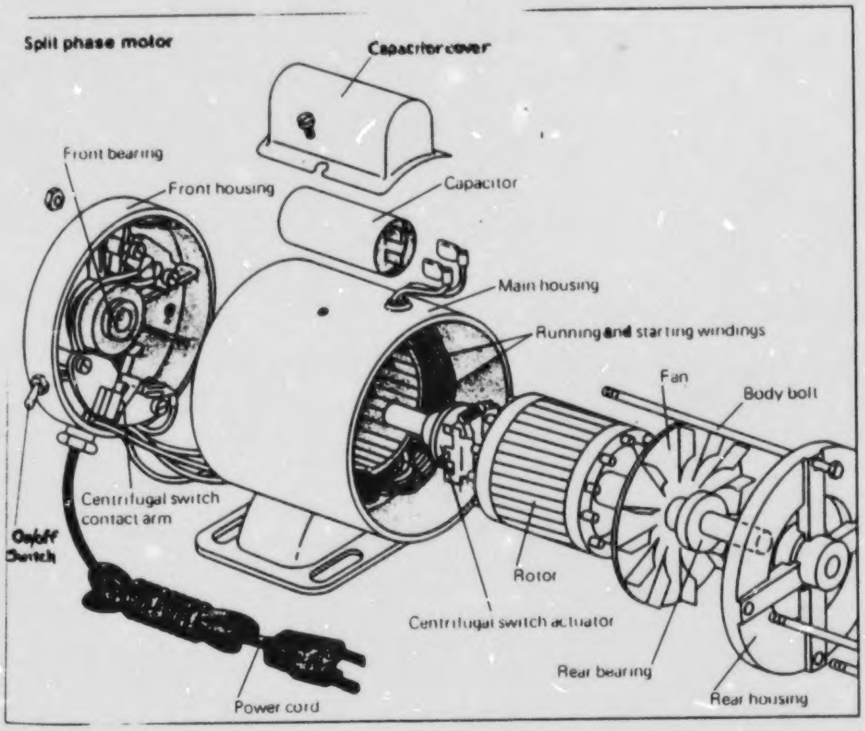
INFORMATION SHEET 425-1

Split phase motor


Capacitor cover
Front bearing
Front housing
Capacitor
Main housing
Running and starting windings
Fan
Body bolt
Centrifugal switch contact arm
On/off Switch
Rotor
Centrifugal switch actuator
Rear bearing
Rear housing
Power cord

Resource# 1
Fix-it-Yourself Manual
Reader's Digest, 1st Ed., 1977
135

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Locate parts on a basic hot water system and identify their function

TASK NO: 500

STUDENT WILL: Locate parts and identify function (operation) of a basic hot water heating system

GIVEN: A hot water system, material and equipment.

TOOLS & EQUIPMENT: flashlight and screwdriver

TASK STEPS:

1. Locate hot water boiler.
2. Identify type of fuel used in heating system.
3. Locate gas or oil shut-off valves.
4. Locate heating system electrical shut-off switch.
5. Follow and identify water lines that go from boiler to radiators and then back to boiler.
6. Determine if heating water lines are connected in a series or loop system.
7. Locate hot water shut-off valves for each heating circuit.
8. Locate cold water supply line and pressure reducing valve.
9. Locate boiler air control fitting and demonstrate how it is connected to the heating system.
10. Locate automatic pressure relief valve and demonstrate how this valve's drain is connected.
11. Locate boiler drain valve.
12. Locate the circulating pump and find the lubricating fittings on the pump.
13. Remove electrical control box at boiler.
14. Replace cover on electrical control box.
15. Locate water temperature control and determine how temperature setting operates.
16. Locate and determine hot wiring to thermostat is connected.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily one each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Owner's Hot Water Boiler Guide and Parts List- Montgomery Ward, 1965
How to Install Radiation Heating Systems-Montgomery Ward, 1960

LEARNING ACTIVITIES

1. Look at pictures that describe hot water heating systems. See textbook pgs. 213, 234, 241, and 280.

2. Read all information listed in Task# 500. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 500 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student locate main parts of hot water boiler?		
2. Did student locate the basic parts of hot water boiler?		
3. Did student identify the water lines that go from boiler to radiator then back again?		
4. Did student identify the hot water shut-off valves for each heating circuit?		
5. Did student identify boiler drain valve?		
6. Did student locate electrical control box?		
7. Did student determine how wiring is connected at electrical control box?		
8. Did student replace cover on control box?		
9. Did student determine how wiring is connected to thermostat?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 500

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Locate parts on a basic hot air system and identify their function

TASK NO: 501

STUDENT WILL: Locate parts on a basic hot air system and identify how thest parts work in system

GIVEN: A basic hot air system, tools and materials.

TOOL & EQUIPMENT: flashlight and screwdriver

TASK STEPS:

1. Locate hot air furnace.
2. Determine type of fuel (gas or oil) used.
3. Locate gas or oil shut-off valves.
4. Locate heating system's electrical shut-off switch.
5. Locate warm air supply ducts, (see textbook pg. 279), and identify direction of air flow in these ducts.
6. Locate cold air return ducts and identify direction of air flow in these ducts.
7. Locate burner and identify the access service panels.
8. Locate blower, service panels to blower and air filter.
9. Change air filter as indicated, (see textbok pg. 288 & 292).
10. Locate dampers (draft regulators) and find out what part of heating system they control, (see textbook pg. 279).
11. Locate electrical control box at the furnace.
12. Remove electrical control box cover look at wiring to determine how it is connected.
13. Replace cover on electrical control box.
14. Locate and determine how wiring to thermostat is connected.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Owner's Manual for Hot Air System

LEARNING ACTIVITIES

1. Look at pictures that describe a basic hot air system. See textbook pgs. 279, 286, and 288. Also, see owner's Manual for hot air heating system.

2. Read all information listed in Task# 501. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. Seee Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 501 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student locate main parts of hot air furnace?		
2. Did student determine the correct type of fuel used in hot air furnace?		
3. Did student identify the direction of air flow in warm air supply ducts?		
4. Did student identify the direction of air flow in cold air return ducts?		
5. Did student change air filter correctly?		
6. Did student identify what part of heating system is controlled by draft regulators?		
7. Did student identify how wiring is connected at electrical control box?		
8. Did student replace cover on control box?		
9. Did student identify how wiring is connected to thermostat?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 501

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Identify parts on a gas burner system and turn on system

TASK NO: 502

STUDENT WILL: Locate and identify basic parts on a gas burner system and turn on system

GIVEN: A gas heating system, tools and equipment.

TOOLS & EQUIPMENT: screwdriver, flashlight, gas leak detector, adjustable wrench, and pipe wrench

TASK STEPS:

1. Look at the owner's guide to gas burner system to do this task.
2. Locate gas line, gas shut-off valve, and water trap.
3. Locate automatic gas valve on heater.
4. Move control on gas valve to "on", "pilot," and "off" positions.
5. Locate the pilot burner and pilot gas supply line to gas valve; light pilot (see textbook pg. 293).
6. Locate the adjusting screw on pilot burner and adjust flame (fire).
7. Locate pilot thermocouple and its connection to gas valve.
8. Locate the main burner mixing tubes and the adjustable air shutters
9. Locate the main burner head, (see textbook pg. 291).
10. Turn on gas burner by raising temperature setting on thermostat.
11. Let burner operate about 5 minutes.
12. Loosen locking screw on air shutter, and close shutter until tips (top ends) of flame change to a yellow color.
13. Now open air shutter until yellow tips of flame change to a soft blue color; tighten the locking screw with air shutter in this position.
14. Repeat this process on all burners.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Owner's Guide to Gas Burner System

LEARNING ACTIVITIES

1. Look at pictures and description of gas burners. See textbook pgs. 291 and 293. Also, see owner's guide to gas burner you are using in this task.

2. Read all information listed in Task# 502. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 502 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student locate indicated parts on gas burner system properly?		
2. Did student move control on gas valve to the three positions indicated?		
3. Did student light pilot as indicated?		
4. Did student adjust screw on pilot burner properly?		
5. Did student turn on gas burner by raising temperature setting on thermostat?		
6. Was air shutter adjusted and locked in position properly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 502

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Test and adjust pilot burner and thermocouple on gas furnace

TASK NO: 503

STUDENT WILL: Test and adjust pilot burner and thermocouple on gas furnace

GIVEN: A gas heating system, tools and equipment

TOOLS & EQUIPMENT: screwdriver, flashlight, small socket wrench set, V.O.M. meter with millivolt range, test leads, and thermocouple test adapter, ST-4 gas heat service trainer panel

TASK STEPS:

1. Remove furnace burner access (entrance) cover to gas valve and pilot gas burner, (see textbook pg. 293).
2. Turn gas valve to the "off" position. This should put out flame, (fire).
3. Remove thermocouple attaching nut at the gas valve, (see Information Sheet 503-2.
4. Connect test adaptor to gas valve.
5. Connect thermocouple to other end of test adapter, (see Information Sheet 503-1.
6. Connect position test lead on V.O.M. meter to outside of thermocouple capillary tube. Connect negative test lead on V.O.M. meter to test adapter terminal. (see Information Sheet 503-2
7. Set the V.O.M. meter between "0" and "100" millivot range.
8. Turn the gas valve to "pilot" and light the pilot bruner.
9. Let the pilot flame heat the thermocouple for 2 minutes or more. The V.O.M. meter needle should rise (go up) to about 30 millivolts. If thermocouple is new. If meter needle goes over 14 millivolts, the thermocouple is still okay.
10. If meter needle does not rise to 14 millivolts, remove thermocouple conection.
11. Clean all contact (touching) surfaces on thermocouple connections and connect it again.

    NOTE: If meter reads under 14 millivolts this time, put in a new thermocouple. You should hear the gas valve open and close when thermocouple is working properly.

(continued on next page)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 503

12. Do another check of thermocouple by turning on the main gas burner and look at the meter to find out the number of millivolts it shows.
13. If meter needle rises more than a few millivolts, adjust the position of thermocouple so it receives less heat from the main burner.
    NOTE: The thermocouple can also get too hot if flame on main burner is not adjusted correctly.
14. Adjust pilot screw for correct flame color (blue fire or light) and correct flame length if necessary.
15. For another thermocouple test blow out the pilot light to find out how much time it takes for the thermocouple to close the gas valve.
16. Remove test adaptor, V.O.M. meter and test leads.
17. Return pilot and thermocouple to operating condition.
18. Repeat the "TASK STEPS" using a gas heat service trainer test panel.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Cooking Service Training Manual
National Training Aids Inc. 1st
American Ed., 1974

LEARNING ACTIVITIES

1. Look at pictures of pilot burner and thermocouple on gas burner. See textbook pgs. 291 and 293. Also, see Information Sheet 503-1 and 503-2.
2. Read all information listed in Task# 503. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did using the ST-4 gas heater service trainer panel. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 503 correctly. See Student Evaluation Checklist in this guide.
6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUAITON CHECKLIST

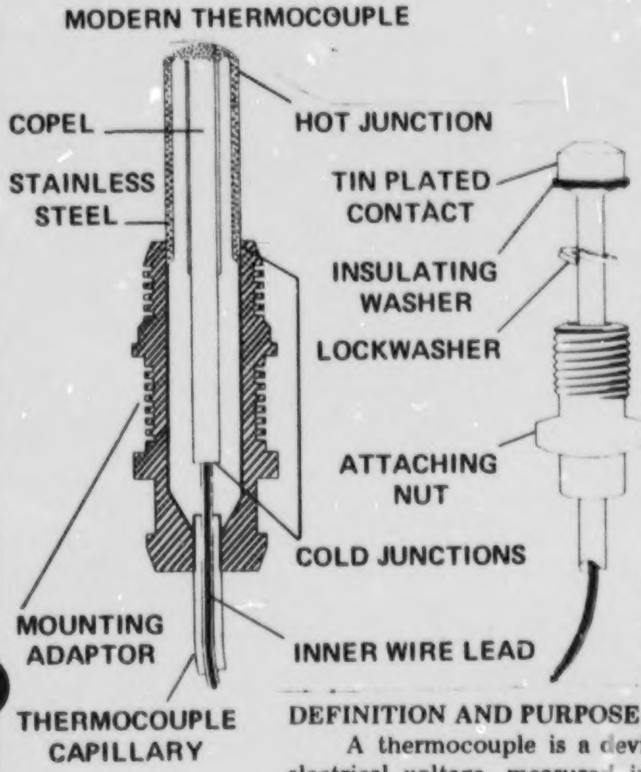
ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student turn on gas valve correctly?		
2. Did student connect thermocouple test adapter correctly?		
3. Did student turn on pilot burner correctly?		
4. Did student read the number of thermocouple millivolts correctly?		
5. Did student determine the condition of the thermocouple correctly?		
6. Did student determine how much time it takes the thermocouple to close the gas valve after pilot light is out?		
7. Was pilot flame adjusted correctly?		
8. Were pilot and thermocouple returned to operating condition?		

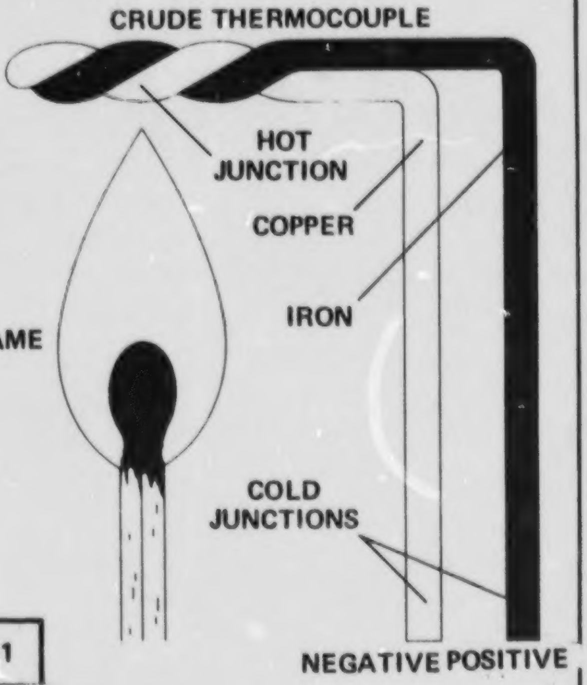
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 503

INFORMATION SHEET 503-1


MODERN THERMOCOUPLE
COPEL
HOT JUNCTION
STAINLESS STEEL
TIN PLATED CONTACT
INSULATING WASHER
LOCKWASHER
ATTACHING NUT
COLD JUNCTIONS
MOUNTING ADAPTOR
INNER WIRE LEAD
THERMOCOUPLE CAPILLARY


CRUDE THERMOCOUPLE
HOT JUNCTION
COPPER
IRON
FLAME
COLD JUNCTIONS
NEGATIVE
POSITIVE

TC-1

DEFINITION AND PURPOSE

A thermocouple is a device that when heated generates a small electrical voltage, measured in *millivolts*. This device is commonly used to operate a gas safety cutoff device in a gas appliance controls system.

PHYSICAL DESCRIPTION

A simple thermocouple consists of two dissimilar wires, such as iron and copper, bonded together at one end. The point where the two wires are joined is called the *hot junction*. The other ends of the two wires are called the *cold junctions*. When the hot junction is heated, a small voltage (millivolts) is generated at the cold junction (illustration T-1).

The modern thermocouple is also made of two dissimilar metals (see illustration T-2). The thermocouple is comprised of a stainless steel (steel-chromium alloy) outer jacket and a *copel* (copper, nickel alloy) inner metal. These particular metals are used because of their durability and higher electrical output.

The point where the copel inner metal is welded to the inside of the stainless steel jacket is the *hot junction*. The point where the opposite end of the copel inner metal is connected to an insulated copper wire is the *cold junction*. The outer steel jacket is normally attached to the top of a brass mounting bracket. The point where the steel jacket is attached to the mounting bracket is another *cold junction*.

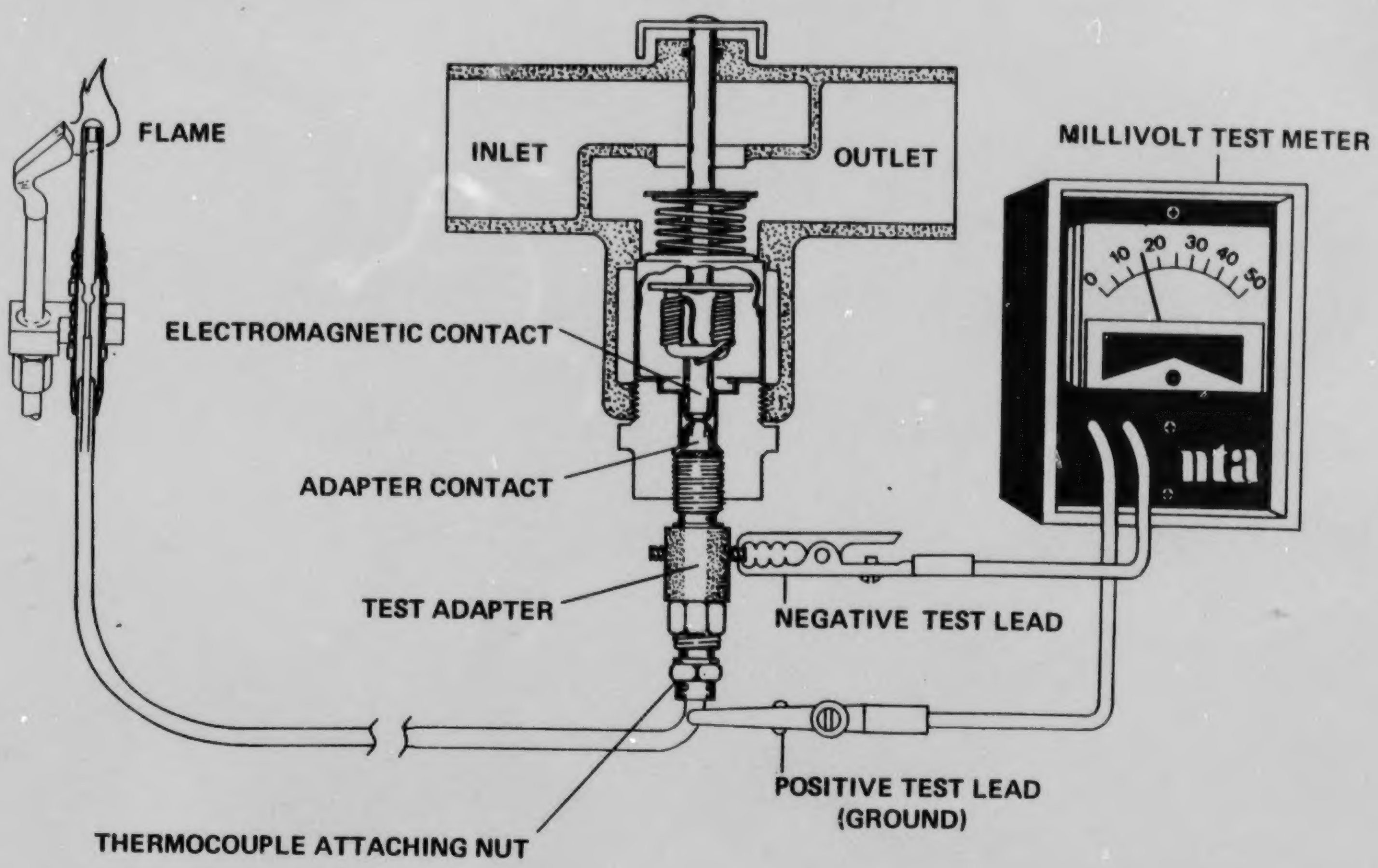
Resource# 1
Cooking Service Training Manual -Nat'l Training Aid Inc.-1st American Ed., 1974, Pg. 72

Program	Task	Page
	503	1

Resource# 1
(continued)

Program	Task	Page
	503	2

TAKING A MILLIVOLT READING ON SAFETY ASSEMBLY


FLAME
INLET
OUTLET
MILLIVOLT TEST METER
0
10
20
30
40
50
nta
ELECTROMAGNETIC CONTACT
ADAPTER CONTACT
TEST ADAPTER
NEGATIVE TEST LEAD
POSITIVE TEST LEAD
(GROUND)
THERMOCOUPLE ATTACHING NUT

INFORMATION SHEET 503-2

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Troubleshoot and repair thermostat

TASK NO: 504

STUDENT WILL: Find problem with thermostat adjust, repair or replace it

GIVEN: A heating system with a thermostat thata is not working properly.

TOOLS & EQUIPMENT: screwdriver, thermometer, V.O.M. meter, and test leads

TASK STEPS:

1. Place thermometer about one foot from thermostat.
2. Locate and remove cover on thermostat, (see textbook pg. 314).
3. Check the voltage across the "R" and "W" terminals on thermostat. It should meassure 24 volts. (see Information Sheet 504-1 in this guide.)
4. Clean electrical contacts of bimetal temperature switch with fine sandpaper, (see Information Sheet 504-2 in this guide.
5. Disconnect wires from the thermostat.
6. Set the range selector on V.O.M. meter to R x 1 ohms scale.
7. Plug in test leads and adjust the V.O.M. meter to "0" (zero).
8. Move thermostat, dial to the highest possible temperature setting, (see Information Sheet 504-3 in this guide.
9. Connect test leads from V.O.M. meter to "R" and "W" terminals on thermostat.
10. Move thermostat dial to a lower temperature setting until the V.O.M. meter indicates there is continuity.
11. Compare lower temperature setting on thermostat with temperature indicated on thermometer.
12. If the temperature you read on the thermostat is different from the temperature you see on the thermometer, move thermostat dial to same temperature indicated on thermometer.
13. Loosen (make loose) the mounting screws on outside of thermostat.
14. Turn the complete thermostat around in a circle until the V.O.M. meter indicates there is continuity.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 504

TASK STEPS:

15. Tighten the screws on outside of thermostat again.
16. Remove V.O.M. test leads
17. Locate the heat anticipator adjustment and look at pointer scale. (see Information Sheets 504-1 and 504-5 in this guide.0
18. Set the pointer scale to .1 to 1.0 amps as indicated on the furnace gas valve, oil furnace control box, or relay.
19. Connect again the wires from the thermostat.
20. Replace cover on thermostat.
21. If thermostat still does not work properly, replace thermostat with a new one of same kind.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual Phase 1 (s)-Lennox Industries Inc. Ed. 1980, "Heating thermostat" pgs. 1-22.

LEARNING ACTIVITIES

1. Look at picture and information on thermostat control for heating a home. See textbook pg. 314.

2. Read all information listed in Task# 504. See Competency Sheet in this guide.
   NOTE: Make sure you look at Information Sheets listed on the Competency Sheet and put in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 504 correctly. See Student Evaluation Checklist in this guide

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Was thermometer placed the correct distance away from thermostat?		
2. Was thermostat cover removed?		
3. Was the voltage across the "R" and "W" terminals on thermostat checked properly?		
4. Were the electrical contacts of bimetal switch cleaned properly?		
5. Were wires on thermostat disconnected?		
6. Was thermostat adjusted properly?		
7. Was the heat anticipator ajusted properly?		
8. Were wire on thermostat connected after work was completed?		
9. Does thermostat operate properly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 504

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Locate and test the low voltage control circuit

TASK NO: 505

STUDENT WILL: Locate and test the low voltage control components, (parts).

GIVEN: A heating system with a low voltage control circuit.

TOOLS & EQUIPMENT: screwdriver, V.O.M. meter and test leads, flashlight, and control schematic

TASK STEPS:

1. Turn off electrical power on heating system.
2. Locate and remove cover from electrical control box on furnace.
   NOTE: An electrical schematic diagram should be attached to the inside of control box cover. (see example on Information Sheet 505-1 in this guide.)
3. Identify the wires and connection terminals by studying the schematic diagram.
4. Connect the test leads on V.O.M. meter to the step-down transformer.
5. Set the V.O.M. selector switch to A.C. voltage.
6. Set the V.O.M. range switch to 50 volts.
7. Turn on electrical power of heating system.
8. Check the V.O.M. voltage. It should read 24 volts.
9. With electric power still on check voltage of other low voltage components.
   CAUTION: Do not bring test leads near the 110 volts lines that come in to the other terminals of step-down transformer. There is danger here of an electrical shock.
10. Check to see that 24 volts are coming across the terminals of all low voltage components with furnace operating.
11. Turn off electrical power on heating system.
12. Replace control box cover.
13. Turn on electircal power of heating system.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 11 (s)-Lennox Industries Inc. Ed., 1980

LEARNING ACTIVITIES

1. Look at schematic diagram of heating system. See Information Sheet 505-1 in this guide.

2. Read all information listed in Task# 505. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instruction in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 505 correctly. See student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student turn off electrical power of heating system before starting job?		
2. Did student locate the wires and connection terminals after studying schematic diagram?		
3. Did student do the voltage testing correctly?		
4. Did student check the voltage of all low voltage components?		
5. Did student keep test leads from V.O.M. away from 110 volt lines when testing low voltage component?		
6. Did student turn off electrical power before putting control box cover on furnace again?		
7. Did student turn power on again after job was completed?		

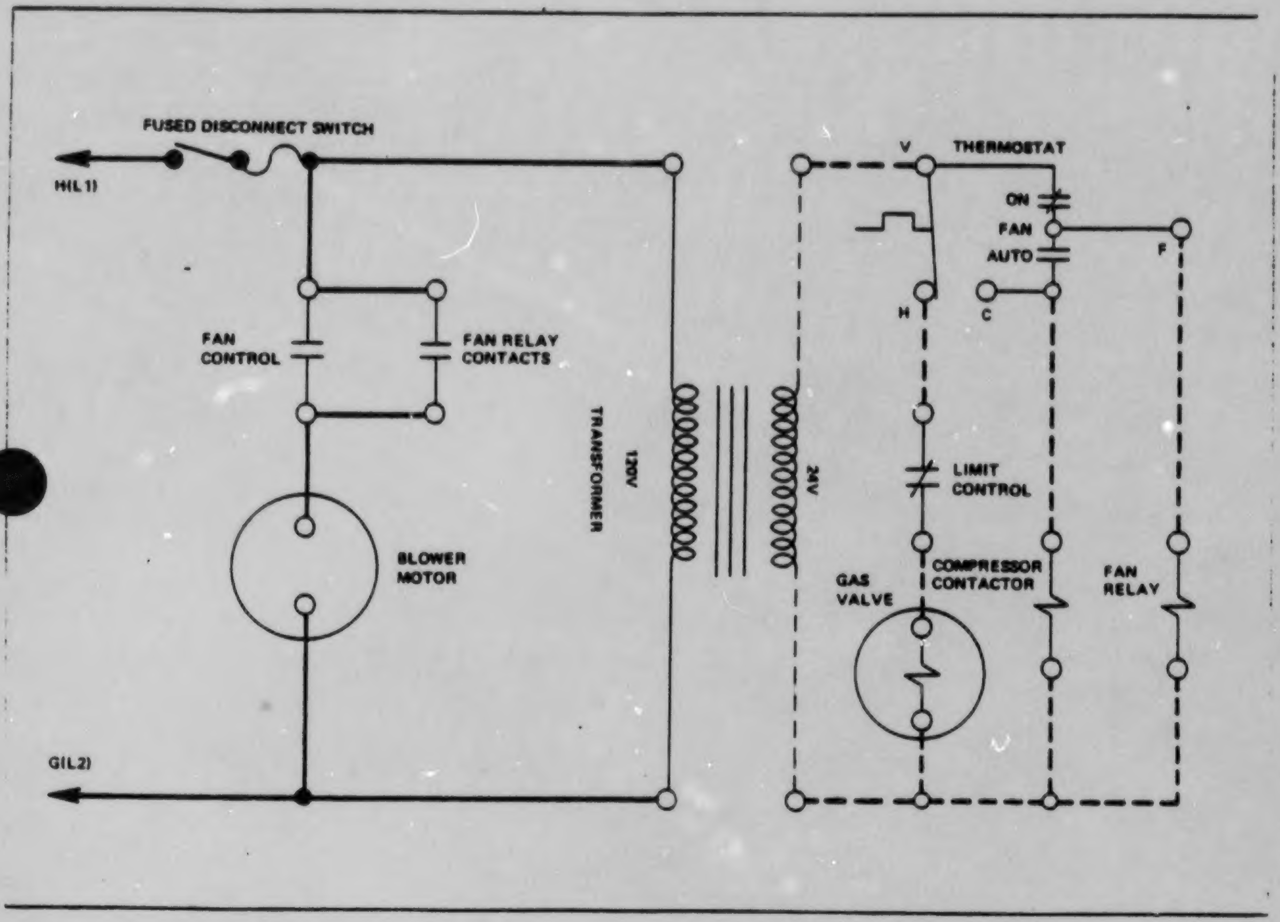
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 505

INFORMATION SHEET 505-1
Parts in a Heating System

COMPLETED SCHEMATIC DIAGRAM


FUSED DISCONNECT SWITCH
H(L1)
FAN CONTROL
FAN RELAY CONTACTS
BLOWER MOTOR
120V
TRANSFORMER
24V
V
THERMOSTAT
ON
FAN
AUTO
F
H
C
LIMIT CONTROL
GAS VALVE
COMPRESSOR CONTACTOR
FAN RELAY
G(L2)

Resource# 1

Phase 11 (s)

Lennox Industries Inc. Ed., 1980
"Heating Thermostat", pg. 30

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Check safety controls while heating system is operating

TASK NO: 506

STUDENT WILL: Check safety controls on:

A. Gas hot water system
B. Gas hot air system
C. Oil hot air system
D. Oil hot water system

GIVEN: Four different heating systems, tools and supplies.

TOOLS & EQUIPMENT: screwdriver, adjustable wrench, flashlight, water bucket

TASK STEPS:

A. Gas Hot Water System:

1. Lift the pressure relief valve to "bleed off" (remove) a little water using a bucket (pail) to hold water. (see Information Sheet 506-1 in this guide.
2. Remove thermocouple connection at the gas valve. Burner and pilot flames should go out. (see Information Sheet 506-2 in this guide).
3. Connect thermocouple and light pilot flame again.
4. Remove wire leads on limit control switch. Heating system should turn off. (see Information Sheet 506-3 in this guide).
5. Attach wire leads to limit control switch again.

B. Gas Hot Air System:

1. Remove thermocouple connection at the gas valve. Burner and pilot flames should go out.
2. Connect thermocouple and light pilot switch.
3. Remove wire leads on limit control switch. Heating system should turn off.
4. Check to see that the barometic damper operates easily. (see Information Sheet 506-4 in this guide.
5. Attach wire leads to limit control switch again.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 506

TASK STEPSS:

C. Oil Hot Air System:

1. Remove leads from flame sensor. Flame should go out. (see Information Sheet 506-5 in this guide).
2. Remove wire leads from limit control switch. Heating system should turn off.
3. Check to see that barometric damper operates easily.
4. Return system to working condition.

D. Oil Hot Water System:

1. Lift the pressure relief valve to bleed off a small amount of water. Use a bucket to hold water.
2. Remove leads from flame sensor. Flame should go out.
3. Attach leads and light flame again.
4. Check to see that barometric damper operates easily.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 1 (s)-Lennox Industries Inc. Ed., 1980

LEARNING ACTIVITIES

1. Look at pictures of safety controls parts on a heating system. See Information Sheets 506-1 to 506-2 in this guide.

2. This task is in four parts. The parts are marked "A", "B", "C", and "D". Read all information listed in part "A" only. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this part of Task# 506. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS," (part "A" only).

5. Now read all information listed in part "B" of Task# 506. See Competency Sheet.

6. Repeat step numbers 3 and 4 of this paper. Do part "B" only.

7. Read information on parts "C" and "D" of Task# 506 as you did for parts "A" and "B". See Competency Sheet in this guide.

8. Repeat step numbers 3 and 4 of this paper for each part of Task# 506.

9. Fill-out checklist to see if you have completed Task# 506 correctly. See Student Evaluation Checklist in this guide.

10. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALAUTION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student check safety controls listed for gas hot water system correctly?		
2. Did student check safety controls listed for gas hot air system correctly?		
3. Did student check safety controls listed for oil hot air system correctly?		
4. Did student check safety controls listed for oil hot water system correctly?		
5. Were all disconnected wire leads connected properly?		
6. Were all thermocouples connected properly after checking them?		
7. Were all heating systems returned to operating condition?		

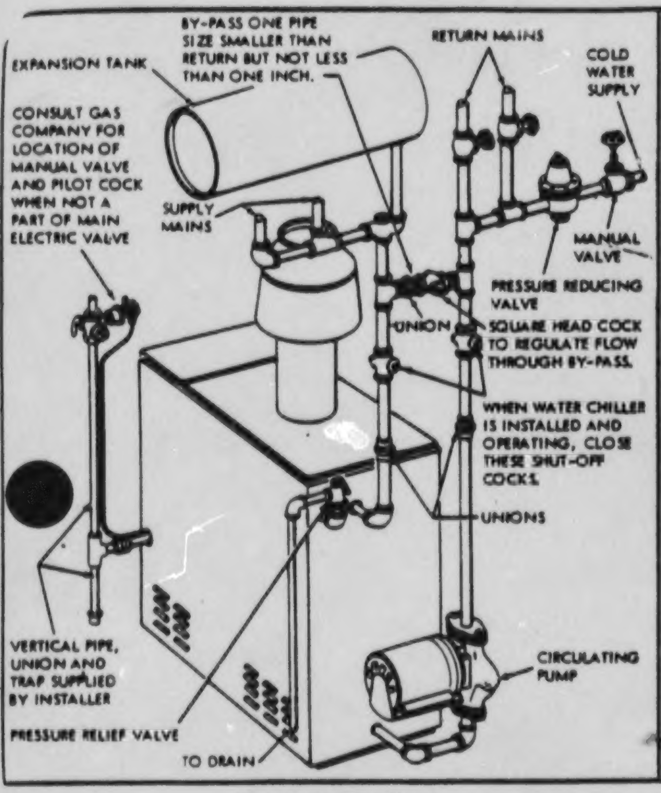
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

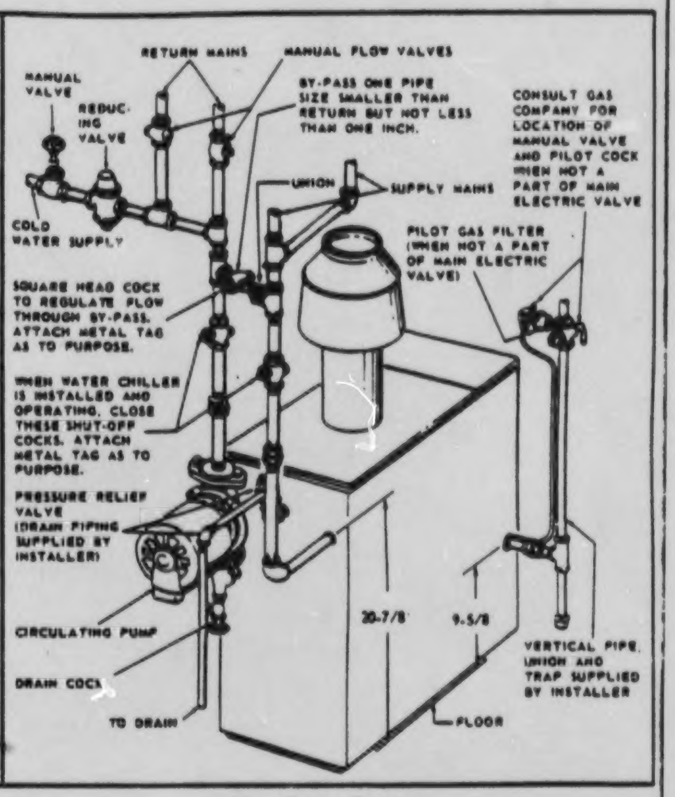
TASK# 506

INFORMATION SHEET 506-1

HEATING SYSTEMS


BY-PASS ONE PIPE SIZE SMALLER THAN RETURN BUT NOT LESS THAN ONE INCH.
RETURN MAINS
EXPANSION TANK
COLD WATER SUPPLY
CONSULT GAS COMPANY FOR LOCATION OF MANUAL VALVE AND PILOT COCK WHEN NOT A PART OF MAIN ELECTRIC VALVE
SUPPLY MAINS
MANUAL VALVE
PRESSURE REDUCING VALVE
UNION
SQUARE HEAD COCK TO REGULATE FLOW THROUGH BY-PASS.
WHEN WATER CHILLER IS INSTALLED AND OPERATING, CLOSE THESE SHUT-OFF COCKS.
UNIONS
VERTICAL PIPE, UNION AND TRAP SUPPLIED BY INSTALLER
CIRCULATING PUMP
PRESSURE RELIEF VALVE
TO DRAIN

Wet Base Boiler

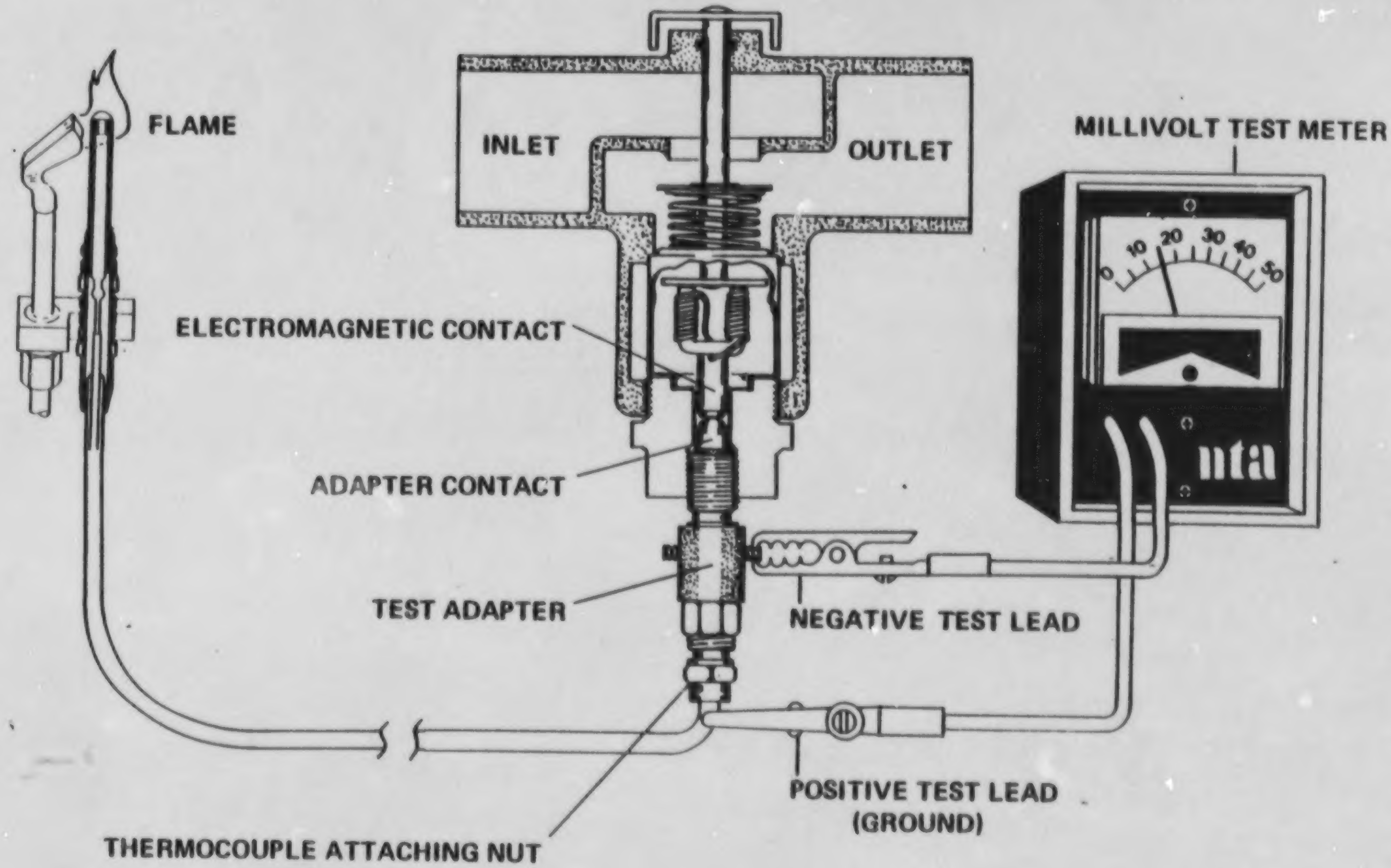

RETURN MAINS
MANUAL FLOW VALVES
MANUAL VALVE
REDUCING VALVE
BY-PASS ONE PIPE SIZE SMALLER THAN RETURN BUT NOT LESS THAN ONE INCH.
CONSULT GAS COMPANY FOR LOCATION OF MANUAL VALVE AND PILOT COCK WHEN NOT A PART OF MAIN ELECTRIC VALVE
UNION
SUPPLY MAINS
COLD WATER SUPPLY
PILOT GAS FILTER (WHEN NOT A PART OF MAIN ELECTRIC VALVE)
SQUARE HEAD COCK TO REGULATE FLOW THROUGH BY-PASS. ATTACH METAL TAG AS TO PURPOSE.
WHEN WATER CHILLER IS INSTALLED AND OPERATING, CLOSE THESE SHUT-OFF COCKS. ATTACH METAL TAG AS TO PURPOSE.
PRESSURE RELIEF VALVE (DRAIN PIPING SUPPLIED BY INSTALLER)
CIRCULATING PUMP
20-7/8
9-5/8
DRAIN COCK
TO DRAIN
FLOOR
VERTICAL PIPE, UNION AND TRAP SUPPLIED BY INSTALLER

Dry Base Boiler

Resource# 1
Phase 11 (s)-Lennox Industries Inc.
Ed., 1980 pgs 2, 4, 13, 16

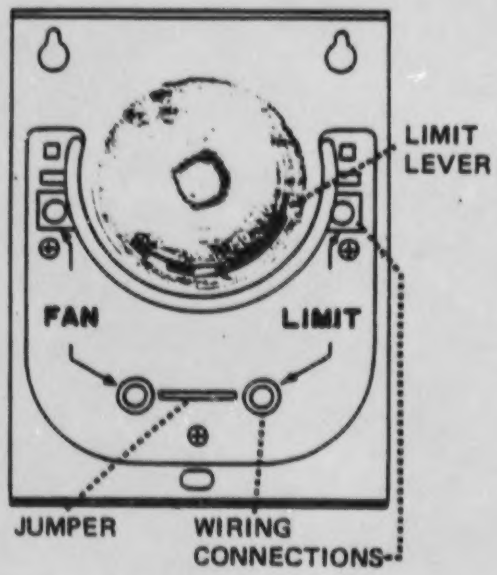
BEST COPY AVAILABLE

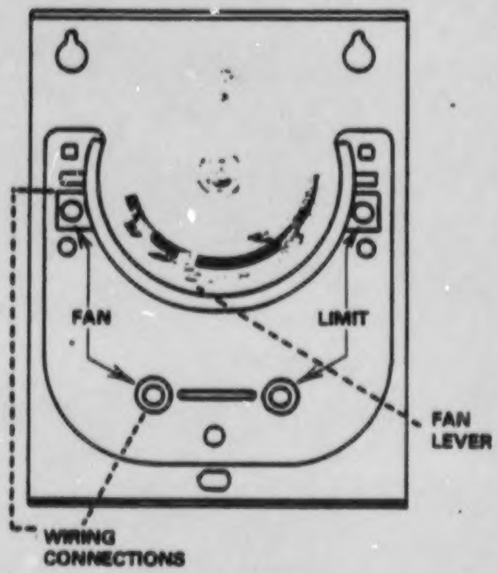
TAKING A MILLIVOLT READING ON SAFETY ASSEMBLY


FLAME
INLET
OUTLET
MILLIVOLT TEST METER
0 10 20 30 40 50
nta
ELECTROMAGNETIC CONTACT
ADAPTER CONTACT
TEST ADAPTER
NEGATIVE TEST LEAD
POSITIVE TEST LEAD
(GROUND)
THERMOCOUPLE ATTACHING NUT

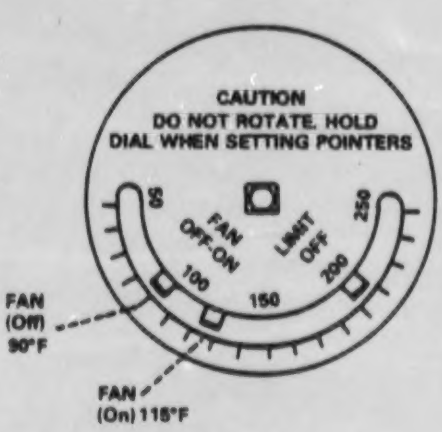
INFORMATION SHEET 506-3

COMBINATION FAN AND LIMIT CONTROL


LIMIT LEVER
FAN
LIMIT
JUMPER
WIRING CONNECTIONS

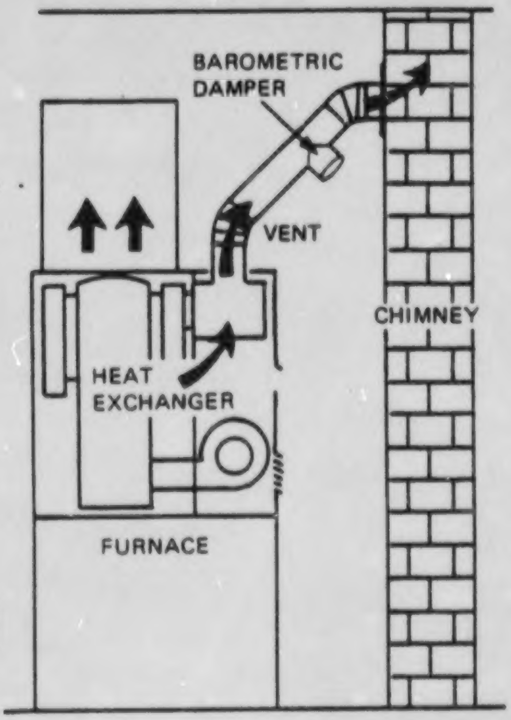

FAN
LIMIT
FAN LEVER
WIRING CONNECTIONS

COMBINATION FAN AND LIMIT CONTROL

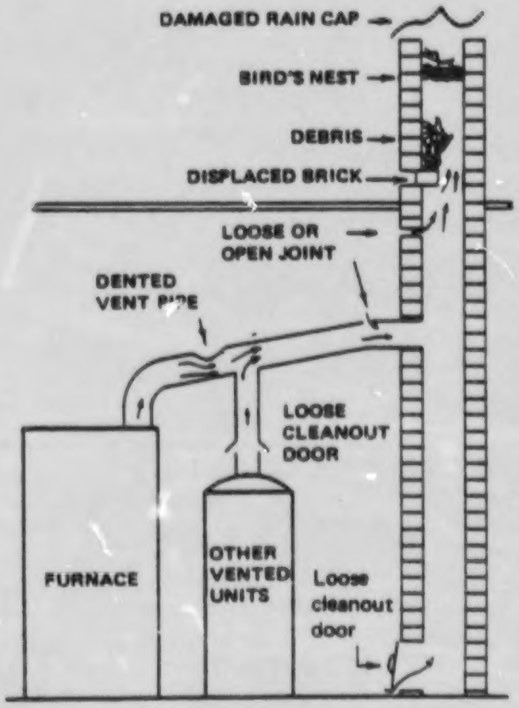

CAUTION
DO NOT ROTATE. HOLD DIAL WHEN SETTING POINTERS
50
FAN OFF-ON
LIMIT OFF
250
100
150
200
FAN (Off) 90°F
FAN (On) 115°F

Resource# 1 Continued

BAROMETRIC DAMPER


BAROMETRIC DAMPER
VENT
CHIMNEY
HEAT EXCHANGER
FURNACE

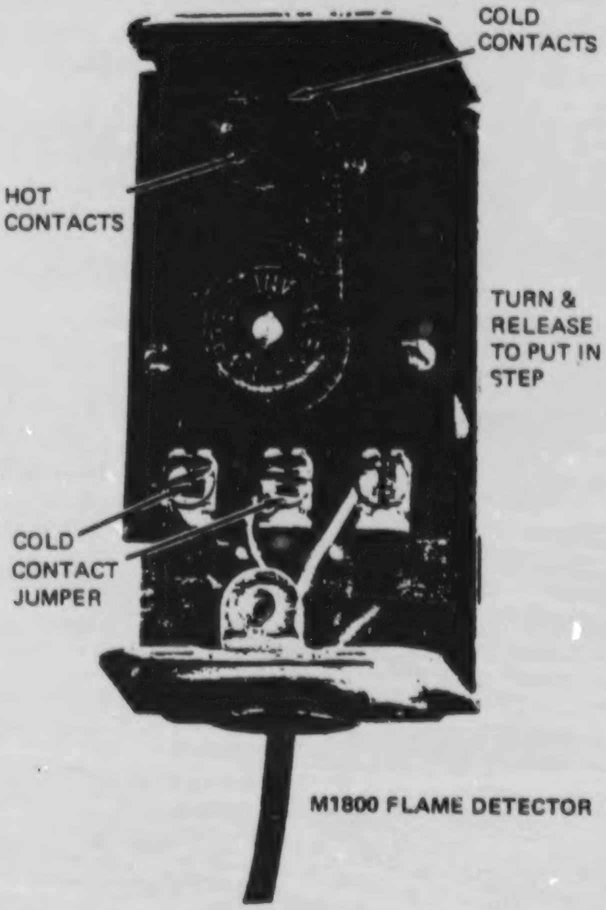
1. Chimney clogged by an obstruction or an accumulation of soot. Chimney should be kept clean.


DAMAGED RAIN CAP
BIRD'S NEST
DEBRIS
DISPLACED BRICK
LOOSE OR OPEN JOINT
DENTED VENT PIPE
LOOSE CLEANOUT DOOR
FURNACE
OTHER VENTED UNITS
Loose cleanout door

source# 1 Continued

THERMAL FLAME SENSORS

The location of the sensor is important. If it is not receiving enough heat, a new location should be found for it.


COLD CONTACTS
HOT CONTACTS
TURN & RELEASE TO PUT IN STEP
COLD CONTACT JUMPER

M1800 FLAME DETECTOR

Resource# 1 Continued

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Check components of an oil burner

TASK NO: 507

STUDENT WILL: Check and service parts of an oil burner

GIVEN: An oil heating system, tools and supplies.

TOOLS & EQUIPMENT: wrench and socket set, screwdriver, flashlight, small cleaning brush, medium grade sandpaper, and clean rags

TASK STEPS:

1. Shut off and disconnect the oil supply line on furnace.
2. Turn off electricity to the furnace.
3. Disconnect the bolts that hold oil pump and move the pump back from the furnace.
4. Locate and check these parts on oil pump: the nozzle, electrodes, fan, pump, transformer, and motor, (See Information Sheet 507-1).
5. Clean all parts without removing them from oil pump.
6. Position oil pump on furnace and connect mounting bolts.
7. Connect oil line and turn electrical power to furnace back on.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 1 (s)- Lennox Industries Inc., Ed., 1980

LEARNING ACTIVITIES

1. Look at components on an oil pump. See Information Sheet 507-1 in this guide.
2. Read all information listed in Task# 507. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 507 correctly.
6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student turn off electrical power before starting task?		
2. Did student shut off oil supply line of furnace before starting task?		
3. Did student disconnect oil pump properly?		
4. Did student locate the parts on oil pump correctly?		
5. Did student clean the parts on oil pump correctly?		
6. Did student position oil pump on furnace correctly?		
7. Did student connect mounting bolt on oil pump?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 507

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Locate and check low voltage controls

TASK NO: 508

STUDENT WILL: Locate and check low voltage controls on an oil heating system

GIVEN: An oil heating system tools and equipment

TOOLS & EQUIPMENT: screwdriver, flashlight V.O.M. meter and test leads, small socket wrench set

TASK STEPS:

1. Turn off electrical power to furnace.
2. Remove electrical control box cover.
3. Follow and locate the 120 volts supply line to the 24 volts transformer, (See Information Sheet 508-1 in this guide.
4. Connect the V.O.M. test leads to the 120 volt transformer supply line.
5. Set V.O.M. meter scale to the 250 volt A.C. range.
6. Turn electrical power on and read the voltage on the V.O.M. meter. Voltage should be 100 watts.
7. Connect the V.O.M. test leads to the other transfomer wires.
8. Set the V.O.M. meter scale to the 50 A.C. range and turn on the electrical power. Voltage should be 24 volts.
9. Follow the wires to locate these low voltage control components: flame detector, fan control, high limit control, and thermostat, (See Information Sheet 508-1 in this guide).
10. Raise the temperature control on the thermostat to turn on furnace.
11. Disconnect one lead from each of the low voltage controls.
    NOTE: Disconnect one control first and then another.
12. Check furnace operation after disconnecting each control.
    CAUTION: Do not touch the 120 volt lead wires.
13. Turn off electrical power to furnace.
14. Replace control box cover on furnace.
15. Turn on electrical power to furnace.
16. Set thermostat to normal temperature.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 11 (s) Lennox Industries Inc. Ed., 1980

LEARNING ACTIVITIES

1. Look at picture of circuit wiring on furnace. See Information Sheet 508-1 in this guide.

2. Read all information listed in Task# 508. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instruction in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 508 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student turn off electrical power to furnace before removing control box cover?		
2. Did student follow and locate the 120 volt supply line to the 24 volt transformer?		
3. Did student test voltage of 120 and 24 volt lines correctly?		
4. Did student follow wires and locate the low voltage control components?		
5. Did student disconnect the lead from each low voltage control correctly?		
6. Did student turn power off again before putting on control box cover?		
7. Did student turn power on after replacing control box cover?		
8. Did student set thermostat to a normal temperature range?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

TASK# 508

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Trouble-shoot heating system

TASK NO: 509

STUDENT WILL: Find the operating problem in a heating system using the trouble-shooting checklist

GIVEN: An oil heating system that is not operating properly, tools and supplies.

TOOLS & EQUIPMENT: flashlight, screwdriver, open end and socket wrench set, medium and fine grade sandpaper, fuses, smooth flat file, extra cad cell, vacuum, pressure gauge

TASK STEPS:

1. Look at and listen to furnace operation to locate problem area on furnace.
2. Find and match the source (problem area) to those listed on the "Trouble-Shoot Checklist," (see pgs 509-1-509-1c in this guide).
3. Using the "Trouble-Shooting Checklist, locate the possible causes (reasons) for the operating problem.
4. Check heating system to find out which of the listed causes is the problem.
5. Determine which procedures (how to fix) and corrections to use, (see "Trouble-Shooting Checklist") to repair the furnace.
   CAUTION: Follow all safety information indicated.
6. Apply all procedures and corrections listed for the source until the problem is corrected.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 1 (s) Lennox Industries Inc. Ed., 1980

LEARNING ACTIVITIES

1. Read all information listed in Task# 509. See Competency Sheet in this guide. Also, use the Trouble-Shooting Checklist on pg. 509-1 to 509-1c in this guide to help you in this task.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
4. Fill-out checklist to see if you have completed Task# 509 correctly. See Student Evaluation Checklist in this guide.
5. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student locate the problem area on furnace?		
2. Did student locate the possible causes for the operating problem?		
3. Did student determine the proper procedure and corrections for repairing furnace?		
4. Did student repair problem on furnace?		
5. Did student follow all safety instructions?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 509

TROUBLE-SHOOTING CHECKLIST 509-1

TROUBLE	SOURCE	PROCEDURE	CAUSES	CORRECTION
BURNER FAILS TO START	Thermostat	Check thermostat settings	Thermostat in "Off" or "Cool"	Switch to "Heat"
			Thermostat set too low	Turn thermostat to higher temp
	Safety Overload	Check burner motor and furnace primary control safety switches	Burner motor overload tripped	Push motor overload reset button
			Primary control tripped on safety	Reset safety switch lever
	Power	Check furnace disconnect switch and main disconnect switch	Switch open	Close switch
			Blown fuse or tripped breaker	Replace fuse or reset breaker
	Thermostat	Touch jumper wire across thermostat terminals on primary control. If burner starts then fault is in thermostat circuit	Broken or loose thermostat wires	Repair or replace wires
			Loose thermostat screw connection	Tighten connection
			Dirty thermostat contacts	Clean contacts
			Thermostat not level	Level thermostat
			Faulty thermostat	Replace thermostat
	Flame Detector (Cad Cell)	Disconnect flame detector wires at primary control. If burner starts fault is in detector circuit	Flame detector leads shorted	Separate leads
			Flame detector exposed to light	Seal off false source of light
			Short circuit in flame detector	Replace detector
	Flame Detector (Stack Control)	Place control in step. If burner does not start, jumper across cold contact terminals. If burner starts the problem is in bi-metal actuated contacts	Cold contacts dirty	Clean contacts
			Bi-metal carboned	Clean bi-metal
			Loose connection or broken wire	Tighten connection or replace wire
			Friction clutch faulty	Replace element or control
			Hot contacts welded	
	Primary Control	Place a 120V trouble light between the black and white leads. No light indicates no power to the control	Limit control switch open	Check dial adjustment (set at 200°F) Jumper terminals. If burner starts switch is faulty. Replace control
			Open circuit between disconnect switch and limit control	Trace wiring and repair or replace
			Low line voltage or power failure	Call power company
		Cad Cell Place a 120V trouble light between orange and white leads. No light indicates control faulty	Defective internal control circuit	Replace control
		Stack Place a 120V trouble light across burner terminals of primary control. No light indicates control faulty	Dirty burner relay contacts	Clean contacts
			Defective internal control circuit	Replace control
	Burner	Place a 120V trouble light between the black and white leads to burner motor. Light indicates power to motor and a burner fault	Binding burner blower wheel Seized fuel pump	Turn off power and rotate blower wheel by hand. If seized free wheel from binding or replace fuel pump
			Defective burner motor	Replace motor
BURNER STARTS BUT NO FLAME IS ESTABLISHED	Oil Supply	Check tank gauge or use dip stick	No oil in tank	Fill tank
		Coat dip stick with litmus paste and insert to bottom of tank	Water in oil tank	If water depth exceeds 1" pump out water or drain out
		Listen for pump whine	Tank shut-off valve closed	Open valve
	Oil Filter and Oil Line	Listen for pump whine	Oil line filter plugged	Replace filter cartridge
			Kinks or restriction in oil line	Repair or replace oil line
			Plugged fuel pump strainer	Clean strainer or replace pump
		Open bleed valve or gauge port. Start burner. No oil or milky oil indicates loss of prime	Air leak in oil supply line	Locate and correct leak Tighten all connections
	Combustion	Check combustion air and draft	Excessive combustion air	Reduce air
			Excessive draft	Reduce draft to .03"-.035" w.c.
	Oil Pump	Install pressure gauge on pump and read pressure. Should be 100psi.	Pump partially or completely frozen—No pressure and motor locks out on overload	Replace pump
			Belt or coupling disengaged or broken—No pressure	Reengage or replace belt or coupling
			Fuel pressure too low	Adjust pressure to 100psi.
	Nozzle	Disconnect ignition leads. Observe oil spray (gun assembly must be removed from unit). Inspect nozzle for plugged orifice or carbon build-up around orifice	Nozzle orifice plugged	Replace nozzle with same size, spray angle and spray type
			Nozzle strainer plugged	
			Poor or off center spray	

Resource# 1
Phase 1 (s) Lennox Industries Inc., Ed., 1980

TROUBLE-SHOOTING CHECKLIST 509-1A

TROUBLE	SOURCE	PROCEDURE		CAUSES	CORRECTION
CONTINUED BURNER STARTS BUT NO FLAME IS ESTABLISHED	Ignition Electrodes	Remove gun assembly and inspect electrodes and leads		Fouled or shorted electrodes	Clean electrodes and leads
				Dirty electrodes and leads	
				Eroded electrode tips	Dress up electrode tips and reset gap to 1/8" and correctly position tips
				Improper electrode gap spacing	
				Improper position of electrode tips	
				Loose or disconnected leads	Reconnect, tighten or replace leads
				Cracked or chipped insulators	Replace electrodes
				Cracked or burned lead insulators	Replace electrode leads
	Ignition Transformer	Connect ignition leads to transformer. Start burner and observe spark. Check line voltage to transformer primary		Low line voltage—less than 105V to transformer primary	Check voltage at power source. Correct cause of voltage drop or call power company
				Burned out transformer windings	Replace transformer
				No spark or weak spark	Properly ground transformer case
	Burner Motor	Motor does not come up to speed and trips out on overload. Turn off power and rotate blower wheel by hand to check for binding or excessive drag		Low line voltage—less than 105V to motor leads	Check voltage at power source. Correct cause of voltage drop or call power company
				Pump or blower overloading motor	Correct cause of overloading
				Faulty motor	Replace motor
BURNER STARTS AND FIRES BUT THEN LOCKS OUT ON SAFETY	Poor Fire	After burner fires immediately jumper across flame detector terminals at primary control	If burner continues to run. Fault may be due to poor fire. Inspect fire	Unbalanced fire	Replace nozzle
				Too much air—lean short fire	Reduce combustion air—Check combustion
				Too little air—long dirty fire	Increase combustion air—Check combustion
				Excessive draft	Adjust barometric damper for correct draft
				Too little draft or restriction	Correct draft or remove restriction
	Flame Detector (Cad Cell)		If fire is good fault is in flame detector. Check detector circuit	Dirty cad cell face	Clean cad cell face
				Faulty cad cell—exceedes 1500 Ohms	Replace cad cell
				Loose or defective cad cell wires	Secure connections or replace cad cell holder and wire leads
	Flame Detector (Stact Control)			Dirty bi-metal element	Clean bi-metal element
				Air leaks into flue pipe or around detector mount	Seal air leaks
				Faulty friction clutch	Replace control
				Welded or shorted cold contacts	
	Primary Control		If burner locks out on safety fault is in primary control	Primary control circuit defective	Replace primary control
BURNER STARTS, FIRES BUT THEN LOOSES FLAME AND LOCKS OUT ON SAFETY	Poor Fire	After burner fires immediately jumper across flame detector terminals at primary control	If burner continues to run (does not lock out on safety). Fault may be due to poor fire (marginal). Inspect fire	Unbalanced fire	Replace nozzle
				Too much air—lean short fire	Reduce combustion air—Check combustion
				Too little air—long dirty fire	Increase combustion air—Check combustion
				Excessive draft	Adjust barometric damper for correct draft
				Too little draft or restriction	Correct draft or remove restriction
	Flame Detector (Cad Cell)		If fire is good fault is in flame detector. Check detector circuit	Dirty cad cell face	Clean cad cell face
				Faulty cad cell—exceedes 1500 Ohms	Replace cad cell
				Loose or defective cad cell wires	Secure connections or replace cad cell holder and wire leads
	Flame Detector (Stack Control)			Dirty bi-metal element	Clean bi-metal element
				Air leaks into flue pipe or around detector mount	Seal air leaks
				Faulty friction clutch	Replace control
				Welded or shorted cold contacts	

TROUBLE-SHOOTING CHECKLIST 509-1B

TROUBLE	SOURCE	PROCEDURE		CAUSE	CORRECTION
CONTINUED BURNER STARTS, FIRES BUT LOOSES FLAME AND LOCKS OUT ON SAFETY	Oil Supply	After burner fires immediately jumper across flame detector terminals at primary control	If burner looses flame (does not lock out on safety). Fault is in fuel system	Pump looses prime—air slug	Prime pump at bleed port
				Pump looses prime—air leak in supply line	Check supply line for loose connection and tighten fitting
				Water slug in line	Check oil tank for water (over 1") pump out water or drain out
				Partially plugged nozzle or nozzle strainer	Replace nozzle
		Listen for pump whine		Restriction in oil line	Clear restriction
				Plugged fuel pump strainer	Clean strainer or replace pump
				Cold oil—outdoor tank	Change to number 1 oil
BURNER STARTS AND FIRES BUT SHORT CYCLES	Thermostat	Check thermostat		Heat anticipator set too low	Correct heat anticipator setting
				Vibration at thermostat	Correct source of vibration
				Thermostat in warm air draft	Shield thermostat from draft or relocate
	Limit Control	Connect voltmeter between line voltage connections to primary control (black and white leads). If burner cycles due to power interruption it is cycling off limit		Dirty air filter (furnace)	Replace or clean filters
				Blower running to slow (furnace)	Speed up blower for 85° to 95°F temperature rise
				Restrictions in return air or supply air system (furnace)	Correct cause of restriction
				Adjustable limit control set too low	Reset limit control to 200°F
	Power	If voltage is less than 105V or fluctuates then fault is in power source. Recheck voltage at power source		Loose wiring connection	Locate and secure connection
				Low or fluctuating line voltage	Call power company
BURNER STARTS AND FIRES, BUT SHORT CYCLES (TOO LITTLE HEAT)	Thermostat	Check thermostat		Heat anticipator set too low	Correct heat anticipator setting
				Vibration at thermostat	Correct source of vibration
				Thermostat in warm air draft	Shield thermostat from draft or relocate thermostat
	Limit Control	Connect voltmeter between line voltage connections to primary control (black and white leads). If burner cycles due to power interruption it is cycling off limit		Dirty air filter (furnace)	Clean or replace filters
				Blower running too slow	Speed up blower for 85° to 95°F temperature rise
				Blower motor seized or burned out	Replace motor
				Blower bearings seized	Replace bearings and shaft
				Blower wheel dirty	Clean blower wheel
				Blower wheel in backwards	Reverse blower wheel
				Wrong motor rotation	Replace with motor of correct rotation
				Restrictions in return air or supply air system	Correct cause of restriction
				Adjustable limit control set too low	Reset limit control to 200°F
	Power	If voltage is less than 105V or fluctuates then fault is in power source. Recheck voltage at power source		Loose wiring connection	Locate and secure connection
				Low or fluctuating line voltage	Call power company
BURNER RUNS CONTINUOUSLY (TOO MUCH HEAT)	Thermostat	Disconnect thermostat wires at primary control	If burner turns off fault is in thermostat circuit	Shorted or welded thermostat contacts	Repair or replace thermostat
				Stuck thermostat bi-metal	Clear obstruction or replace thermostat
				Thermostat not level	Level thermostat
				Shorted thermostat wires	Repair short or replace wires
				Thermostat out of calibration	Replace thermostat
				Thermostat in cold draft	Correct cause of draft or relocate thermostat
	Primary Control		If burner does not turn off fault is in primary control	Defective primary control	Replace primary control

Resource# 1
(continued)

TASK# 509

TROUBLE-SHOOTING CHECKLIST 509-1C

TROUBLE	SOURCE	PROCEDURE		CAUSE	CORRECTION
BURNER RUNS CONTINUOUSLY (TO LITTLE HEAT)	Combustion	Check burner combustion for CO_2, stack temperature and smoke	Low CO_2 less than 8%	Too much combustion air	Reduce combustion air
				Air leaks into heat exchanger around inspection door, etc.	Correct cause of air leak
				Excessive draft	Adjust barometric damper for correct draft
				Incorrect burner head adjustment	Correct burner head setting
			High smoke reading more than No. 1 smoke	Dirty or plugged heat exchanger	Clean heat exchanger
					Readjust burner
				Insufficient draft	Increase draft
				Incorrect burner head adjustment	Correct burner head setting
				Too little combustion air	Increase combustion air
			High stack temperature more than 550°F Net.	Too little blower air	Speed up blower for 85° to 95°F temperature rise
				Blower belt too loose and slipping	Tighten blower belt
				Dirty or plugged heat exchanger	Clean heat exchanger
				Dirty blower wheel	Clean blower wheel
				Dirty air filter (furnace)	Clean or replace filters
				Restricted or closed registers or dampers	Readjust registers or dampers
	Nozzle and Oil Pressure	Inspect fire, check nozzle size and check oil pressure		Partially plugged or defective nozzle	Replace nozzle
				Nozzle too small	Increase nozzle size
				Oil pressure too low (less than 100psi)	Increase oil pressure to 100psi

Resource# 1
(continued)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Locate and identify components on an electrical heating system

TASK NO: 510

STUDENT WILL: Locate and identify the different parts on an electrical heating system

GIVEN: An electrical heating system.

TOOLS & EQUIPMENT: NONE

TASK STEPS:

1. Turn off the electrical power to furnace.
2. Remove cover on furnace to see the parts inside.
3. Locate and identify the following parts of furnace: heat elements, circuit breakers, heat relays, sequences, transformer, blower, compartment, and blower relay. (See Information Sheet 510-1 in this guide).
4. Put on furnace cover again.
5. Turn on eletrical power to furnace.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 1 (s)- Lennox Industries Inc., Ed., 1980

LEARNING ACTIVITIES

1. Look at pictures of parts in electric furnace. See Information Sheet 510-1 in this guide.
2. Read all information listed in Task# 510. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 510 correctly. See Student Evaluation Checklist in this guide.
6. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

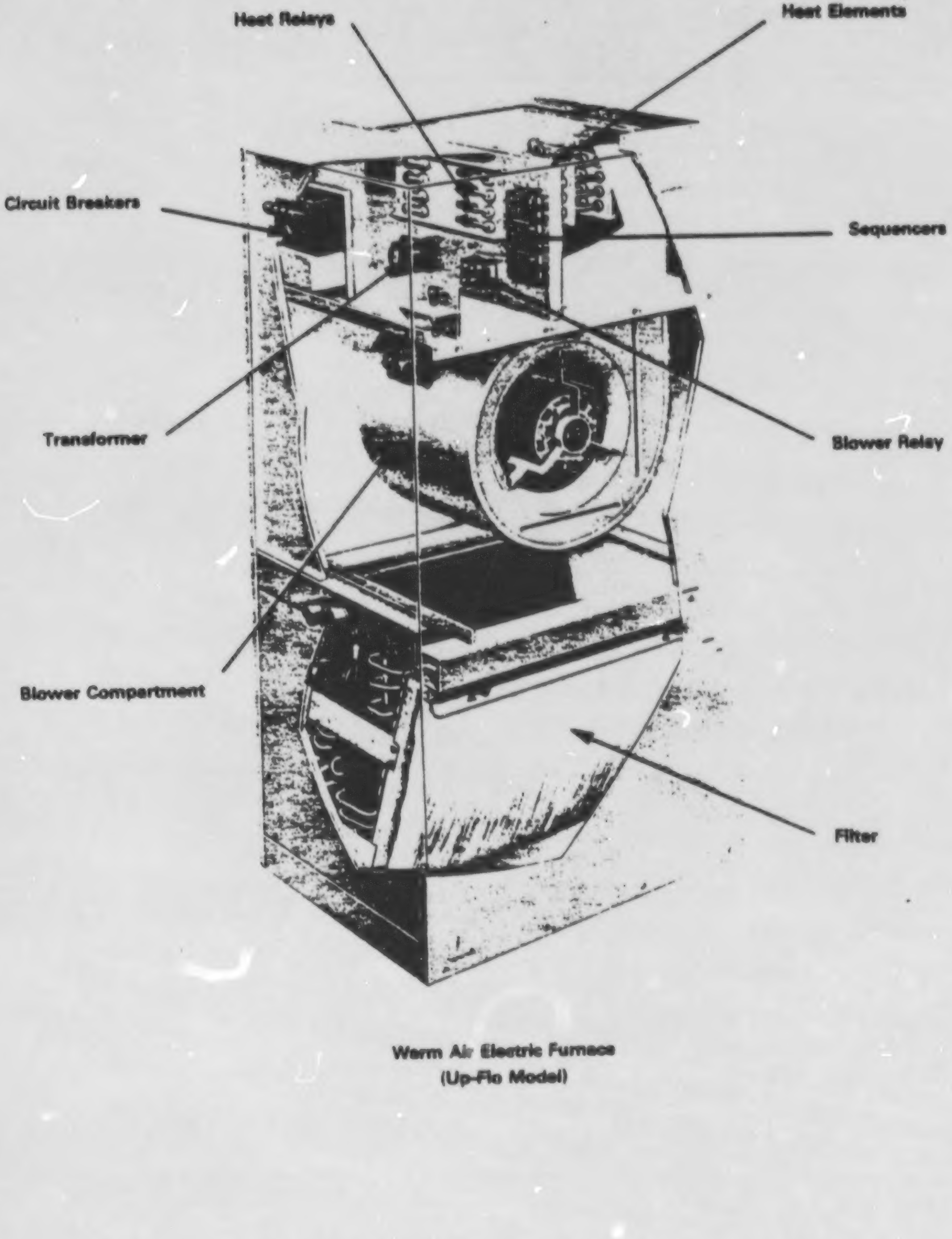
ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student turn off electrical power before removing cover on furnace?		
2. Did student locate and identify each furnace component as indicated?		
3. Did student turn on electrical power after putting on the furnace cover again?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 3
TOTAL POINTS POSSIBLE = 3

TASK # 510

INFORMATION SHEET 510-1


Heat Relays
Heat Elements
Circuit Breakers
Sequencers
Transformer
Blower Relay
Blower Compartment
Filter

Warm Air Electric Furnace
(Up-Flo Model)

Program	Task	Page
	510	1

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Heating Related Duties

JOB TASK: Check heating on an electric furnace

TASK NO: 511

STUDENT WILL: Check to find out if heating elements in furnace are working properly

GIVEN: An electrical furnace that is not operating correctly, tools and supplies.

TOOLS & EQUIPMENT: flashlight screwdrivers, small socket wrench set, V.O.M. meter and test leads, clip-on amp meter, small cleaning brushes, and fine grade sandpaper

TASK STEPS:

1. Turn off electric power to furnace.
2. Take off inspection panel on furnace.
3. Check all electrical power to furnace.
4. Place test leads from V.O.M. on power lines that are coming in to furnace.
5. Set range on V.O.M. meter to 250 A.C. volts.
6. Turn on electric power and remove V.O.M. test leads.
7. Turn off electric power and remove V.O.M. test leads.
8. Snap (attach) the clip-on amp meter around one hot wire of a heat element. (See Information Sheet 511-1 in this guide.)
9. Turn on electric power and check amperage.
   CAUTION: Do not touch amp meter or wire while electricity is turned on for safety reasons.
10. Repeat the same steps for each heat element.
11. Now place the clip-on amp meter over all the lead wires of heating element to get the total amperage draw.
12. Turn off electrical power to furnace and remove the clip-on map meter.
13. Turn on electrical power to furnace again.
14. Check the inside and outside thermostats for proper operation.
15. Check blower and make sure it is operating properly.
16. Inspect filter and change if necessary.
17. Check the difference in temperature between the air in supply duct and air in the return duct. The difference in temperature should be within the range listed on the furnace nameplate.
18. Turn of electic power and clean the relay contact points as indicated.
19. Put on the inspection panel and turn on electrical power again.

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

TASK NO: 511

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Phase 1 (s)-Lennox Industries Inc. Ed., 1980

LEARNING ACTIVITIES

1. Read new words that are going to be presented in this task. See Information Sheet 511-1 in this guide.

2. Read all information listed in Task# 511. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to se if you have completed Task# 511 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student turn off electrical power to furnace before removing inspection panel?		
2. Did student test voltage properly?		
3. Did student check amperage of each heat element properly and safely?		
4. Did student determine the total amperage draw of heating system?		
5. Did student check the temperature difference between the supply duct and return duct properly?		
6. Did student check the inside and outside thermostats properly?		
7. Did student replace inspection panel after the task was finished?		
8. Did student turn on electrical power after the task was finished?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 8
TOTAL POINTS POSSIBLE = 8

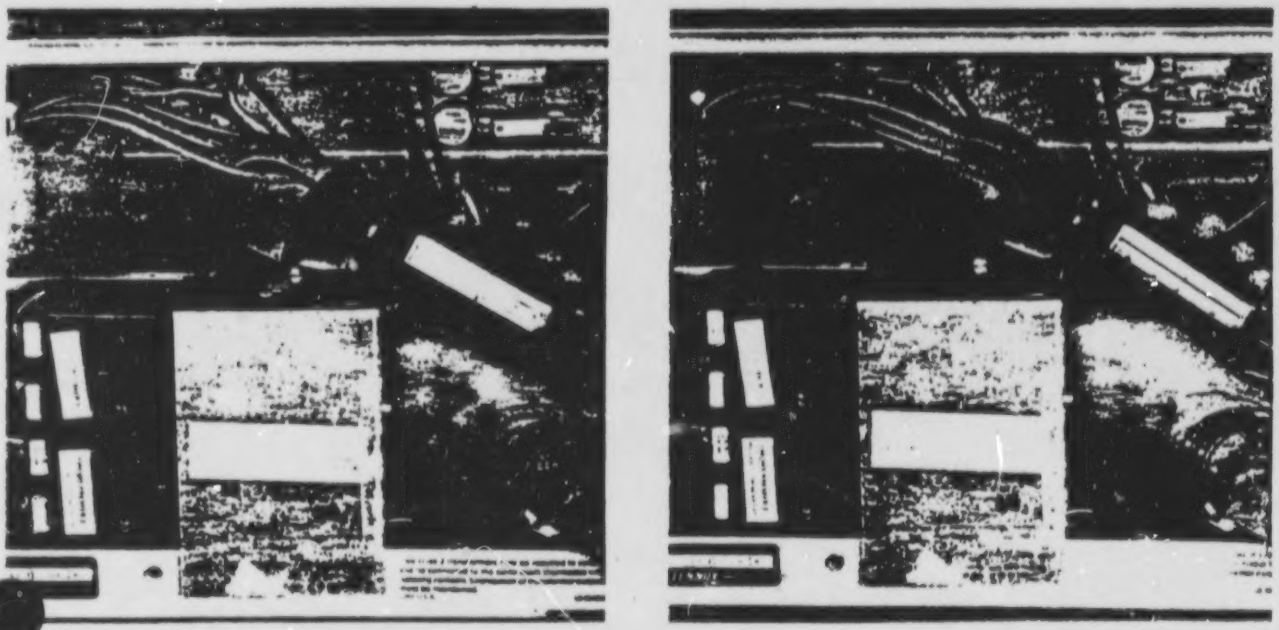
TASK# 511

INFORMATION SHEET 511-1

STUDY WORDS:

supply duct	- a tube or pipe that delivers hot air from furnace to room
return duct	- a tube or pipe that returns cool air form room back to furnace
amperage drain	- the total amount of amperage that a piece of electrical equipment puts out
within range	- inside the limit or amount indicated
furnace nameplate	- a thin piece of metal that has the name of the furnace and other information printed on it
panel	- a cover or door on furnace

CLIP-ON AMP METER



Resources
Phase i (s) Lennox Industries
Inc. Ed., 1980 pg. 7

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Small Engine Related Duties

JOB TASK: Identify and inspect components of a 2 cycle gasoline engine

TASK NO: 600

STUDENT WILL: Identify and inspect the parts of a 2 cycle gasoline engine

GIVEN: A 2 cycle gasoline engine, tools, and supplies.

TOOLS & EQUIPMENT: open end wrenches, socket wrench set, screwdrivers, flywheel puller, torque wrench, and engine gasket set

TASK STEPS:

1. Take off all engine components that are easy to remove, (examples: carburetor, air filter, gas tank, starter, spark plug, muffler, carburetor, governor cables and levers). See Information Sheet 600-1 in this guide.
2. Remove flywheel and air passage covers.
3. Remove cylinder head and crankcase cover.
4. Inspect piston, connecting rod, crankshaft, reed valve, and exhaust parts as indicated.
5. Put all the parts that you removed back on engine. Install them in the opposite order that you took them off.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: An Owner's Service Manual
Fix-it-Yourself Manual- Reader's Digest, 1st Ed., 1977

LEARNING ACTIVITIES

1. Look at picture of components of a small 4 cycle engine. See Information Sheet 600-1 in this guide.
2. Read all information listed in Task# 600. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See Teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
5. Fill-out checklist to see if you have completed Task# 600 correctly. See Student Evaluation Checklist in this guide.
6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student remove all indicated components properly?		
2. Did student remove engine covers properly?		
3. Did student remove the cylinder head and crankcase cover properly?		
4. Did student inspect all indicated engine parts properly?		
5. Did student pat all the indicated parts back on enging properly?		

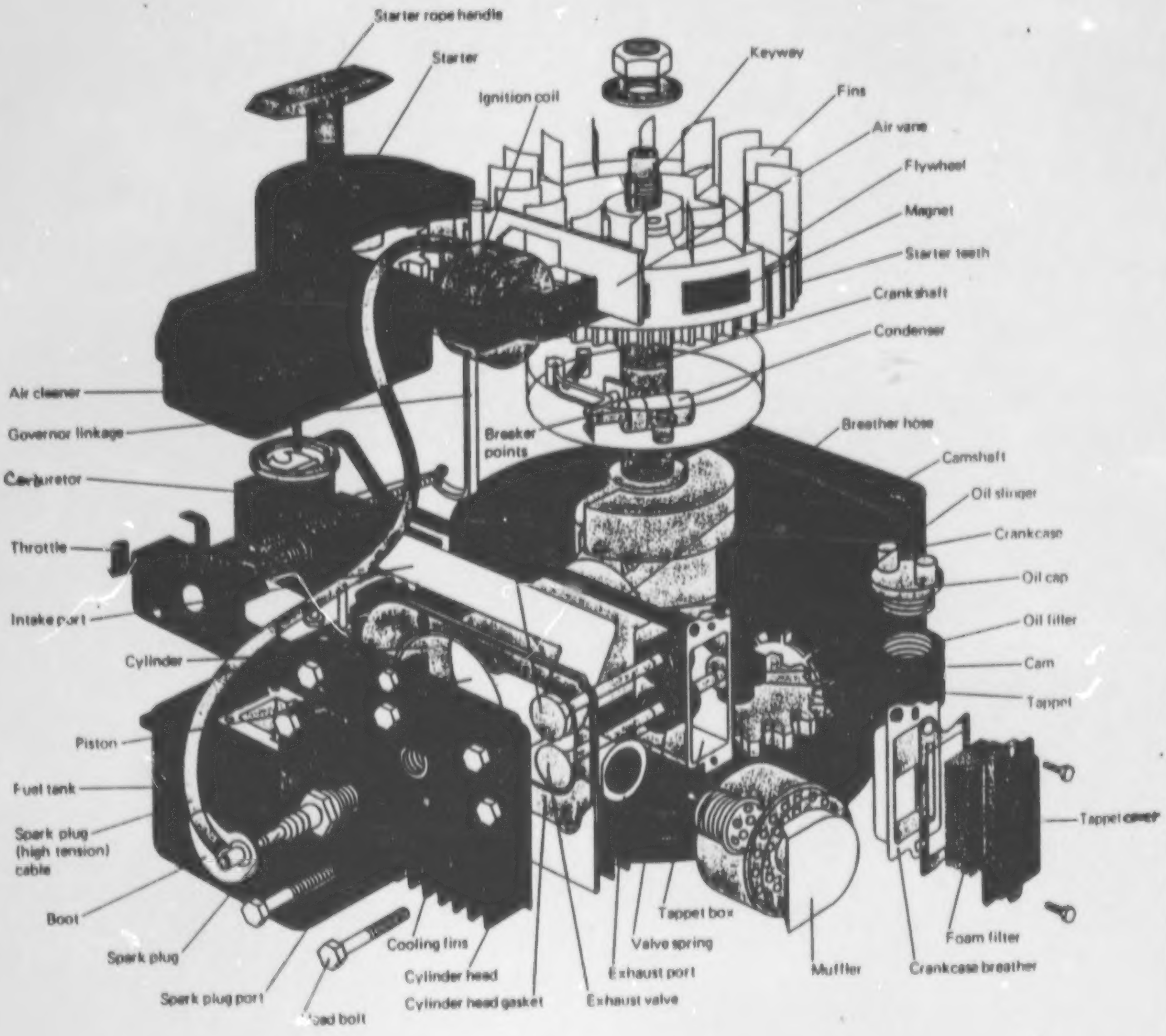
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 600

INFORMATION SHEET 600-1

Small engines


Starter rope handle
Starter
Ignition coil
Keyway
Fins
Air vane
Flywheel
Magnet
Starter teeth
Crankshaft
Condenser
Air cleaner
Governor linkage
Breaker points
Breather hose
Camshaft
Oil slinger
Crankcase
Carburetor
Throttle
Oil cap
Oil filler
Intake port
Cylinder
Cam
Tappet
Piston
Fuel tank
Tappet cover
Spark plug (high tension) cable
Boot
Spark plug
Spark plug port
Head bolt
Cooling fins
Cylinder head
Cylinder head gasket
Tappet box
Valve spring
Exhaust port
Exhaust valve
Muffler
Foam filter
Crankcase breather

Resource# 1
Fix-it-Yourself Manual Reader's Digest 1977 pg. 370

Program	Task	Page
	600	1

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Small Engine Related Duties

JOB TASK: Identify and inspect components of a 4 cycle gasoline engine

TASK NO: 601

STUDENT WILL: Identify and inspect the parts of a small 4 4 cycle gasoline engine (motor)

GIVEN: A 4 cycle gasoline engine, tools and supplies

TOOLS & EQUIPMENT: open end wrenches, socket wrench set, screwdrivers, flywheel puller, torque wrench, pan for collecting engine oil and engine gasket set

TASK STEPS:

1. Take off all engine components that are easy to remove, (examples: carburetor, air filter, gas tank, starter, spark plug, muffler, and governor linkages). See Information Sheet 512-1 in this guide.
2. Drain oil from engine crankcase. Use pan to collect oil.
3. Remove flywheel and air passage covers.
4. Remove cylinder head and crankcase cover.
5. Inspect piston, connecting rod, crankshaft, camshaft, intake and exhaust valves and valve springs as indicated.
6. Put all the parts that you removed back on the engine. Install them in the opposite order that you took them off.
7. Put oil in the engine crankcase as indicated.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: An Owner's engine service Manual
Fix-it-yourself _Manual_-Reader's Digest, 1st Ed. 1977

LEARNING ACTIVITIES

1. Look at picture of components of a small 4 cycle engine. See Information Sheet 601-1 in this guide.

2. Read all information listed in Task# 601. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See Teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 601 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student remove all indicated components of engine properly?		
2. Did student drain oil from crankcase properly?		
3. Did student remove engine covers properly?		
4. Did student remove the cylinder head and crankcase cover properly?		
5. Did student inspect all indicated engine parts indicated?		
6. Did student put all the indicated parts back on engine properly?		
7. Did student put the right amount of oil in engine crankcase?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 601

The two-cycle (two-stroke) engine

In the two-cycle engine, there is one power stroke for every second stroke of the piston. It occurs, of course, on each downward stroke. Because there is no exhaust stroke, the exhaust gases must be released from the cylinder when the piston completes its power stroke. This is accomplished when the piston uncovers ports (or holes) in the walls of the cylinder during its downward movement. (See sequence illustrated at right.)

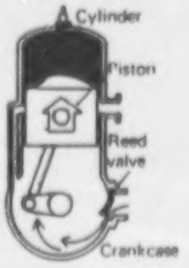
The ports of a two-cycle engine serve the same purpose as the valves in a four-cycle engine. Some designs use a reed valve—a flexible strip of metal or plastic that serves as a one-way gate—between the carburetor and the airtight crankcase. To distinguish between these two kinds of valves, the mushroom-shaped valves of a four-cycle engine are technically known as poppet valves.

The underside of the piston acts as a pump on the two-cycle engine, drawing the fuel-air mixture into the crankcase, then forcing it up into the cylinder.

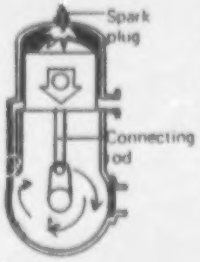
The spark plug is fired by a magnetic ignition. Magnets in the flywheel generate an electrical current in a coil of wire every time they pass it. When the breaker points are opened, this current jumps as high as 20,000 volts and is transferred to the spark plug.

Because it has fewer parts, and gives twice as many power strokes per engine revolution, the two-cycle engine is lighter and more powerful than a four-cycle engine of the same size. But because it uses more fuel than a four-cycle engine, the two-cycle is generally used only on machines that need an especially small or lightweight power plant, such as chain saws. To determine if an engine is a two-cycle or a four-cycle model, look for oil fill or drain plugs on the crankcase. Oil is mixed with the gasoline on two-cycle engines, so they have no oil plugs. Two-cycle engines are also known as two-stroke engines.

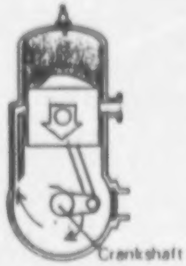
How a two-cycle engine works


Cylinder
Piston
Reed valve
Crankcase

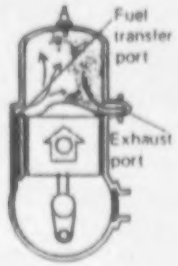
1. On upward stroke, fuel mixture already in cylinder is compressed. Vacuum formed in airtight crankcase by rising piston draws more mixture from the carburetor and past the reed valve.


Spark plug
Connecting rod

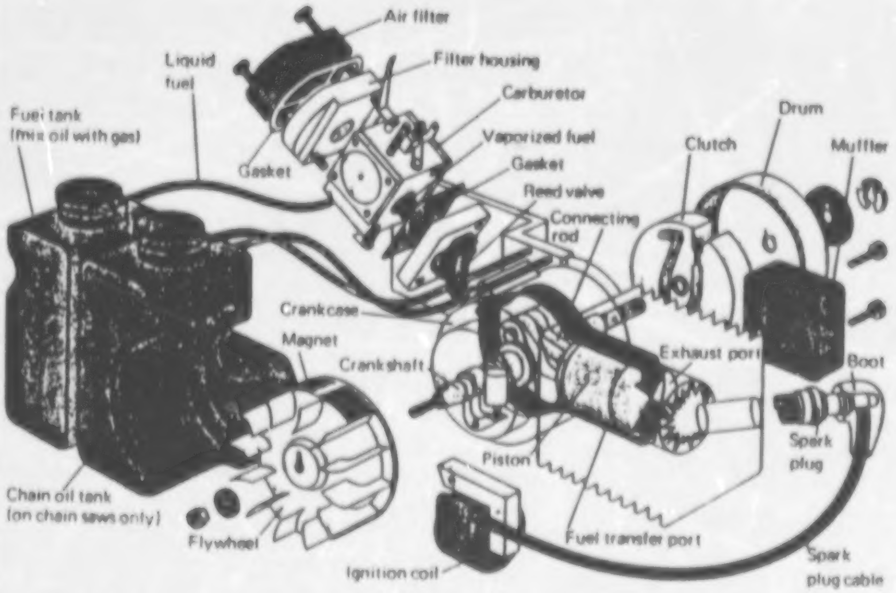
2. At top of stroke, pressure stabilizes in the crankcase and the reed valve springs shut. The spark plug fires and starts the power (downward) stroke.


Crankshaft

3. On downward stroke, power is transmitted to the crankshaft, and the fuel-air mixture in the crankcase is compressed by the descending piston.


Fuel transfer port
Exhaust port

4. Near the bottom of the stroke, the piston uncovers the ports and the pressurized fuel-air mixture rushes into the cylinder, forcing the burned gases out the exhaust port.


Air filter
Liquid fuel
Filter housing
Carburetor
Fuel tank (mix oil with gas)
Gasket
Vaporized fuel
Gasket
Reed valve
Connecting rod
Clutch
Drum
Muffler
Crankcase
Magnet
Crankshaft
Exhaust port
Boot
Spark plug
Piston
Chain oil tank (on chain saws only)
Flywheel
Fuel transfer port
Ignition coil
Spark plug cable

Resource# 1
Fix-it-Yourself Manual
Reader's Digest 1st Ed., 1977 pg. 371

Program	Task	Page
	601	1

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Small Engine Related Duties

JOB TASK: Indentify and inspect the parts of the carburetor on each of the three small engines

TASK NO: 602

STUDENT WILL: Identify and inspect the parts of each carburetor on three small gasoline engines of different types

GIVEN: Three gasoloine engines with different carburetors, (a float carburetor, a diaphragm carburetor, and a suction lift carburetor).

TOOLS & EQUIPMENT: open end wrenches, socket wrench set, and screwdrivers

TASK STEPS:

1. Remove cables and fuel line at the carburetor.
2. Remove carburetor from the engine block.
3. Take the carburetor apart and inspect all its components.
   NOTE: Do not lose any of the small components.
4. Assemble (put together) parts on carburetor again.
5. Attach carburetor to engine block.
6. Connect cables and fuel line to carburetor.
7. Repeat the above steps (numbers 1 to 6) for all three carburetors.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: An Owner's engine service Manual
Fix-it-Yourself Manual-Reader's Digest, 1st Ed., 1977

LEARNING ACTIVITIES

1. Look at pictures and information on three different types on small gasoline engines. See Float carburetor pg. 602-1, Diaphragm carburetor pg. 602-2 and Suction Lift carburetor pg. 602-3 in this guide.

2. Read all information listed in Task# 602. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See Teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 602 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student remove all cables and fuel lines correctly?		
2. Did student remove each carburetor from engine block properly?		
3. Did student take each carburetor apart without losing any small components?		
4. Did student assemble all indicated parts on each carburetor again?		
5. Did student attach each carburetor to its engine block properly?		
6. Did student connect cables and fuel lines on all carburetors properly?		

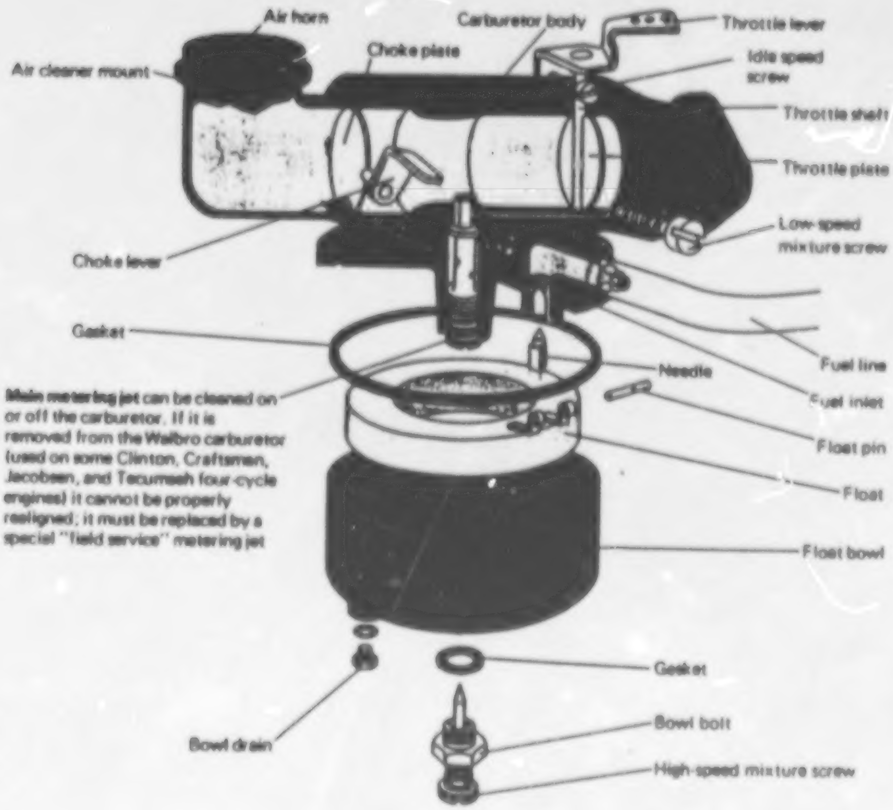
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

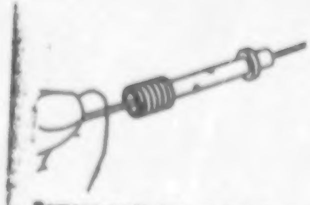
TASK# 602

Float carburetors

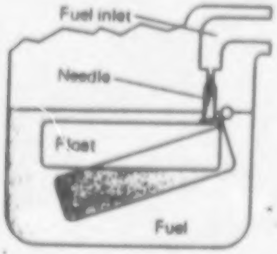
This type of carburetor uses a float to regulate the flow of fuel. When fuel is low in the bowl, the float drops and opens a needle valve, allowing gasoline to enter. The rising fuel level pushes the float up, closing the valve. This action assures a consistant supply of fuel at the carburetor, regardless of fluctuations in fuel pump performance or gravity feed.


Air horn
Carburetor body
Throttle lever
Choke plate
Air cleaner mount
Idle speed screw
Throttle shaft
Throttle plate
Low-speed mixture screw
Choke lever
Gasket
Fuel line
Needle
Fuel inlet
Float pin
Float
Float bowl
Gasket
Bowl bolt
Bowl drain
High-speed mixture screw

Main metering jet can be cleaned on or off the carburetor. If it is removed from the Walbro carburetor (used on some Clinton, Craftsman, Jacobsen, and Tecumseh four-cycle engines) it cannot be properly realigned; it must be replaced by a special "field service" metering jet



Remove main fuel metering jet from the bowl bolt. Clean jet with solvent and a whisk broom bristle (not a wire) or compressed air


Fuel inlet
Needle
Float
Fuel

Remove float and shake it. If there is fuel inside, float has sprung a leak and must be replaced. A float with a leak will slowly sink

Resource# 1
Fix-it-Yourself Manual
Reader's Digest 1st Ed., 1977 pg. 376 to 378

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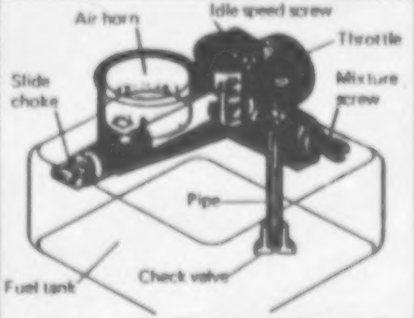
Suction lift carburetors

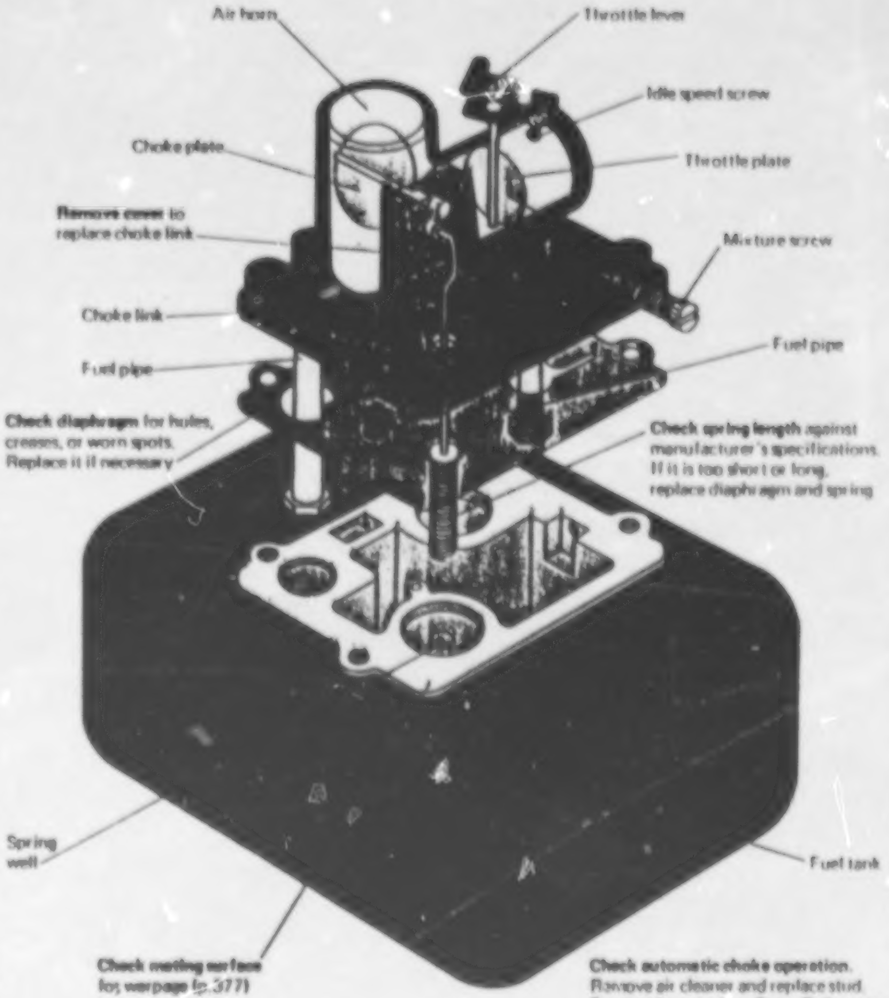
The simple suction lift carburetor is mounted on top of the gas tank. Air rushing through the air horn forms a partial vacuum that draws fuel up a pipe to the carburetor jet, where it is atomized. The principle is identical to the one used in perfume atomizers. The carburetor has one or two fuel pipes. Those with two have a simple diaphragm fuel pump at the top of the longer pipe.

Some of these diaphragms have flaps that act as one-way valves to control fuel flow. Others use fiber discs or balls for the same purpose. Hold the carburetor so that the diaphragm is on top and level; then, remove it carefully to prevent the tiny balls from falling out before you have a chance to note where they belong.

The rebuild kit for these carburetors contains new fuel pipes. Nylon pipes are simply unscrewed; metal pipes must be pried out (see illustrations at right). Before you pry out a metal pipe, measure its length from the bottom to the point where it enters the carburetor body. The replacement pipe must be pressed into the body exactly the same distance. Use small sockets and screwdrivers when working on the carburetor to prevent damaging delicate parts.


Air horn
Idle speed screw
Throttle
Slide choke
Mixture screw
Pipe
Fuel tank
Check valve

Simplest suction lift carburetor has a single pipe with a check valve at the bottom. More sophisticated version (right) has a diaphragm pump and two pipes with screens at their ends.


Air horn
Throttle lever
Idle speed screw
Choke plate
Throttle plate
Mixture screw
Choke link
Fuel pipe
Fuel pipe
Spring well
Fuel tank

Remove cover to replace choke link

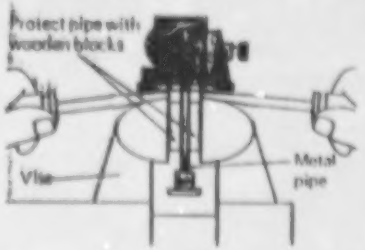
Check diaphragm for holes, creases, or worn spots. Replace it if necessary

Check spring length against manufacturer's specifications. If it is too short or long, replace diaphragm and spring

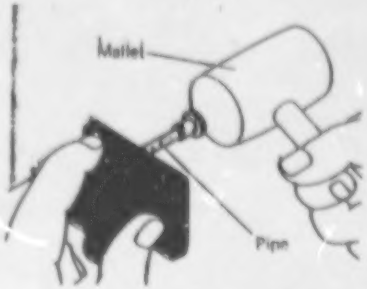
Check mating surface for warpage (p. 377)

Check automatic choke operation. Remove air cleaner and replace stud. Set speed control on Stop. Pull starter rope rapidly. Choke plate should open and close alternately. If plate binds, clean link, plate, and air horn with solvent. If choke still does not work, replace link, spring, and diaphragm

To test a ball check valve, remove pipe and shake it. If ball does not rattle, dip valve briefly in solvent. Replace pipe if ball will not move. Use a small socket wrench on nylon pipes; do not force or strip threads


Protect pipe with wooden blocks
Vise
Metal pipe

Measure the exact length of a metal pipe (see text), then remove it by mounting it in a vise and prying against the carburetor with two screwdrivers. Insert new pipe same distance


Mallet
Pipe

Use a soft-faced mallet to gently tap the new pipe into the carburetor body, or press it in using the jaws of the vise. Measure the length of the pipe often as you install it

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Diaphragm Carburetors

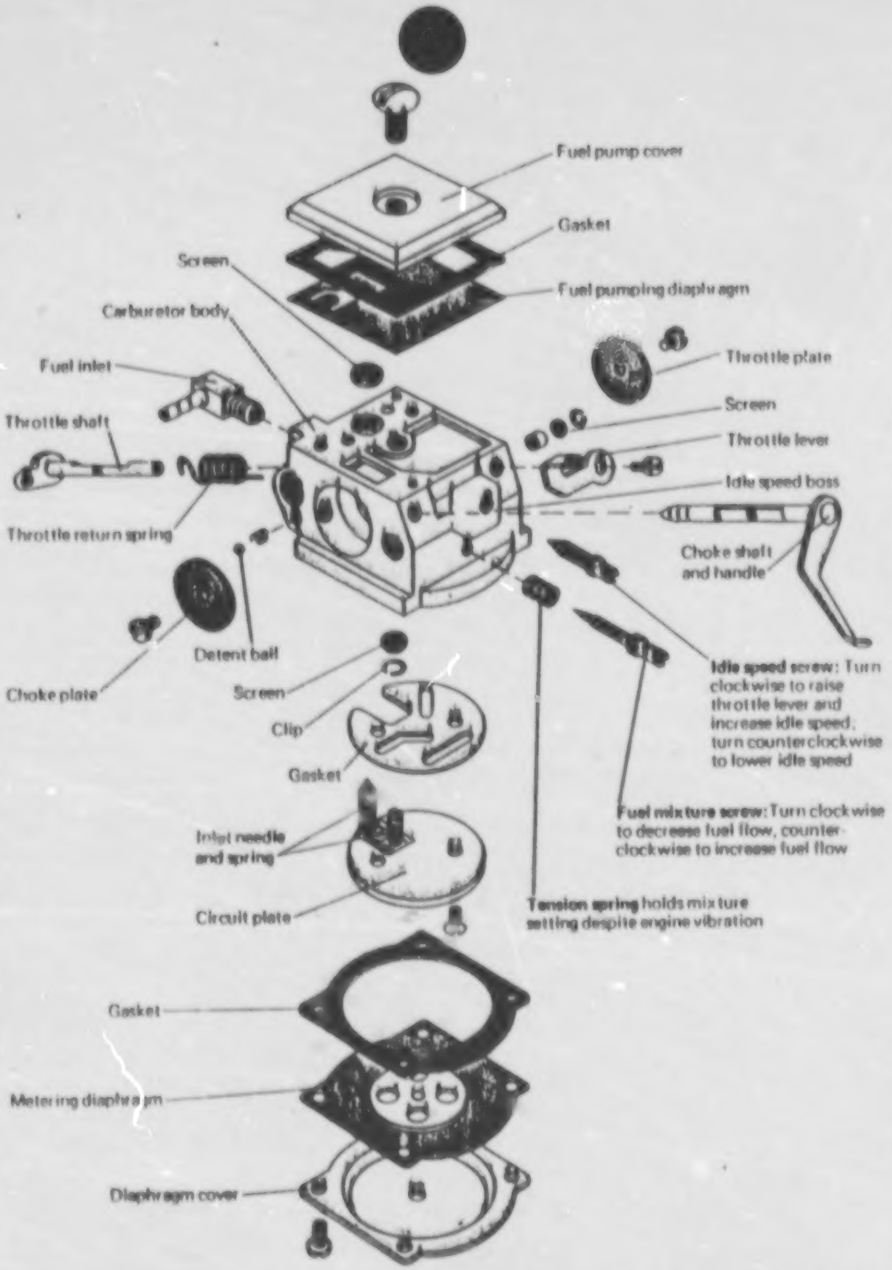
This kind of carburetor is used on equipment that must operate in many positions, such as a chain saw. It contains one or more pulsating diaphragms, which act as pumps to supply fuel to the carburetor jets. Unlike floats, diaphragms are not affected by gravity.

Remove the carburetor from the engine for cleaning or rebuilding. Gaskets, diaphragms, and nylon parts can be damaged by strong cleaning solvents. Remove them all from the carburetor body before cleaning it. Lay the pieces out in the order in which they are removed and make a sketch or take a Polaroid picture of them to be sure you can reassemble all the pieces properly. If you prefer, you can buy a parts list with an exploded-view drawing from the dealer or manufacturer.

If your carburetor has **plastic** jets (check with the parts dealer when buying gaskets or solvent), soak it in solvent for no more than 20 minutes, agitating it every 5 minutes. If you have an all-metal model, soak it for an hour, agitating it every 15 minutes. Blow passages dry with compressed air (available in aerosol cans at photo supply stores). Clean springs, adjustment screws, and other metal parts that will not be replaced. Check the gasket mating surfaces for warping.

How to check mating surfaces

Check the gasket mating surfaces on the carburetor and engine with a straightedge. If you can slip a .002-in. feeler gauge under it, the surface is badly warped. Use two gaskets or a nonhardening liquid gasket for reassembly.


Fuel pump cover
Gasket
Fuel pumping diaphragm
Screen
Carburetor body
Throttle plate
Fuel inlet
Screen
Throttle shaft
Throttle lever
Idle speed boss
Throttle return spring
Choke shaft and handle
Detent ball
Choke plate
Screen
Clip
Gasket
Inlet needle and spring
Circuit plate
Gasket
Metering diaphragm
Diaphragm cover

Idle speed screw: Turn clockwise to raise throttle lever and increase idle speed; turn counterclockwise to lower idle speed

Fuel mixture screw: Turn clockwise to decrease fuel flow, counterclockwise to increase fuel flow

Tension spring holds mixture setting despite engine vibration

Hold diaphragm to light, inspect for pinholes. Hold metal pin in center, gently try to rotate diaphragm. If it turns, there is a leak; replace it.

Pry out filter screen with a needle or awl. Use a punch that conforms to screen curvature to press the replacement firmly into place.

Pierce old Welch plug with an awl and pry it out. Flatten replacement plug slightly with a blunt punch to install. Coat edges with nail polish.

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Small Engine Related Duties

JOB TASK: Adjust ignition points and carburetor

TASK NO: 603

STUDENT WILL: Adjust the ignition points and carburetor on a small gasoline engine

GIVEN: A small gasoline engine.

TOOLS & EQUIPMENT: open end wrench set, socket wrench set, screwdrivers, flywheel puller dial indicator with sleeve and extender leg, and continuity tester

TASK STEPS:

1. Remove flywheel and spark plug.
2. Install dial indicator in spark plug hole with sleeve extender towards piston. (see picture# 1 on pg. 603-1 in this guide.
3. Adjust sleeve so that extender touches piston.
4. Tighten sleeve screw.
5. Turn flywheel with your hand until piston is in the middle of top part (also called "top dead center"), on the compression stroke.
6. Adjust dial indicator to zero and turn flywheel counter clockwise (left) until needle on dial indicator is at 050 inches. (see picture# 2 on pg. 603-1 in this guide.
7. Set the breaker point gap as indicated, (usually .020 inch). See picture# 3 on pg. 603-1 in this guide.
8. Attach continuity tester across breaker points. (see picture# 4 on pg. 603-1 in this guide.
9. Rotate (turn) breaker point assembly until points begin to open. Tester should indicate no continuity.
10. Tighten breaker assembly screws in position when points begin to open. This should adjust points for proper timing. (see picture# 5 on pg. 603-1 in this guide.
11. Remove dial indicator and continuity tester.
12. Replace spark plug and flywheel.
13. Fill gas tank with fresh gasoline.
14. Fill crankcase with oil as indicated.
15. Adjust the high speed mixture screw on carburetor 1 1/2 turns out from closed position.
16. Adjust the low speed mixture screw on carburetor 3/4 of a turn out from closed position.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTNEANCE PROGRAM
(CONTINUED)

TASK NO: 603

TASK STEPS:

17. Start engine.
18. Adjust high speed mixture screw with engine running at a high speed.
19. Adjust low speed mixture screw with engine idling (low speed on engine). High and low speed adjustments should continue until engine runs smoothly.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Tecumseh Ignition Systems-Trouble-shooting Booklet Tecumseh Product Company

LEARNING ACTIVITIES

1. Read all information listed in Task# 603. See Competency Sheet in this guide.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS". Also see pg. 603-1 in this guide.
4. Fill-out checklist to see if you have completed Task# 603 correctly. See Student Evaluation Checklist in this guide.
5. Give teacher the completed Student Evaluation Checklist to to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student remove flywheel and spark plug properly?		
2. Did student adjust dial indicator properly?		
3. Did student adjust breaker point gap properly?		
4. Did student adjust points timing properly?		
5. Did student adjust the high speed mixture screw on carburetor correctly?		
6. Did student adjust the low speed mixture screw on carburetor correcly?		
7. Does engine run smoothly at high low speeds?		

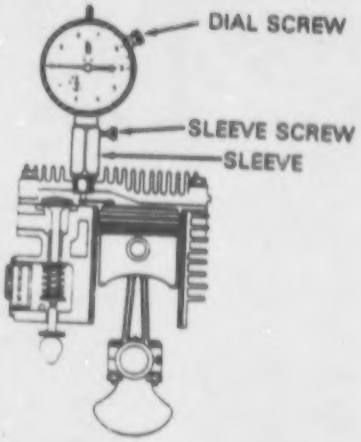
TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

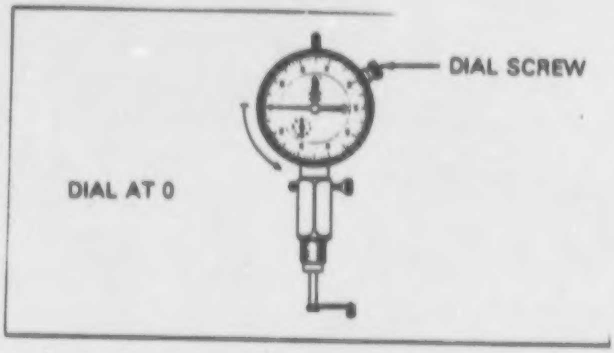
TASK# 603

INFORMATION SHEET 603-1

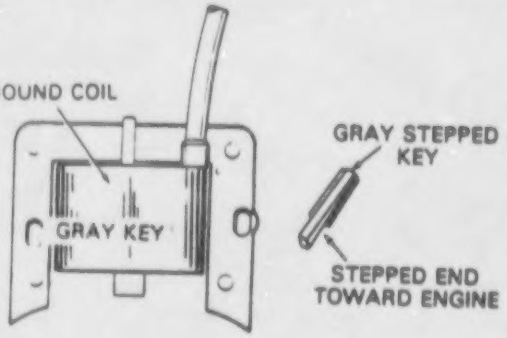
DIAGRAMS


DIAL SCREW
SLEEVE SCREW
SLEEVE

Pi:ture #1


DIAL SCREW
DIAL AT 0

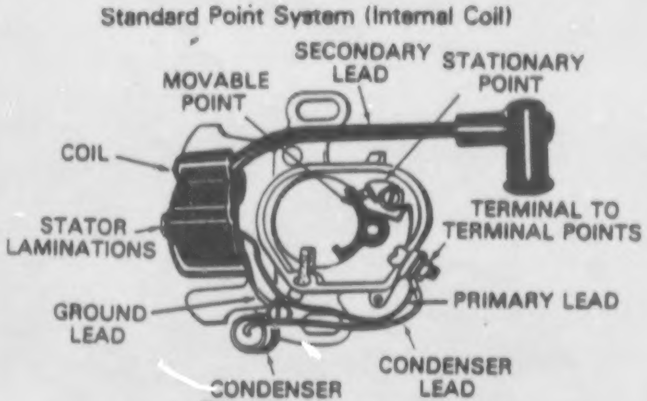
Picture #2


ROUND COIL
GRAY KEY
GRAY STEPPED KEY
STEPPED END TOWARD ENGINE

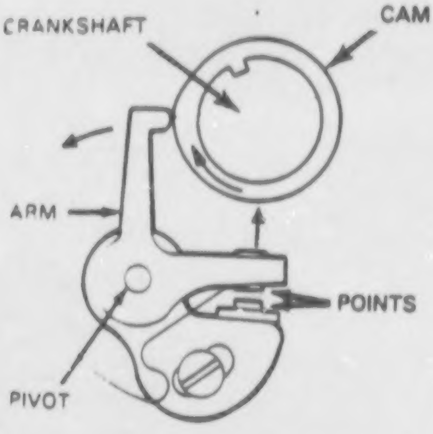
Picture #3

Begin the timing procedure, torque down the stator bolts to secure the stator in place. Next rotate the crankshaft until the point arm is resting on the high side of the ingition cam. Set the point gap at .020", by loosening the screw on the movable point, and insert a .020" feeler gauge between the contact points. Tighten the screw on the movable point and then recheck the point gap. Be sure to clean contact points with lint free paper.

Reinstall the proper flywheel key, flywheel, washer, and torque down the flywheel nut to specification. Reinstall the external coil, but do not tighten down the mounting screws.


Standard Point System (Internal Coil)
SECONDARY LEAD
STATIONARY POINT
MOVABLE POINT
COIL
STATOR LAMINATIONS
TERMINAL TO TERMINAL POINTS
PRIMARY LEAD
GROUND LEAD
CONDENSER LEAD
CONDENSER

Picture #4


CRANKSHAFT
CAM
ARM
POINTS
PIVOT

Picture #5

Resource: Tecumseh Ignition Systems
Trouble-Shooting booklet -Tecumshe products Co.
Pg. 3-5,6,7

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Small Engine Related Duties

JOB TASK: Trouble-shoot a small gasoline engine

TASK NO: 604

STUDENT WILL: Find and repair the problem on a small gasoline

TOOLS & EQUIPMENT: open end wrench set, small socket wrench set, screwdrivers, spark tester, and spark plug wrench

TASK STEPS:

1. Turn flywheel quickly to your left. Flywheel should return to original position when you let go of it if compression is good.
2. Remove spark plug ignition wire from the spark plug.
3. Connect spark plug ignition wire to spark tester.
4. Turn flywheel quickly and look for a spark, (a particle of burning light caused by electrical friction) indicates [illegible] good ignition system.
5. Adjust the "fast" and "slow" speed on the mixture screw [illegible] the carburetor as indicated in engine service manual.
6. Fill gas tank with fresh gasoline.
7. Pull starter cable on engine. Engine should start.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: An engine service manual

LEARNING ACTIVITIES

1. Read all information listed in Task# 604. See Competency Sheet in this guide. Also ask teacher for an engine service manual.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
4. Fill-out checklist to see if you have completed Task# 604 correctly. See Student Evaluation Checklist in this guide.
5. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student do compression test properly?		
2. Did student connect spark plug ingnition wire to spark tester?		
3. Did student do spark plug ignition test correctly?		
4. Did student adjust the "fast" and "slow" speed on mixture screws correclty?		
5. Did student use an engine service manual?		
6. Did engine start quickly?		
7. Did engine run smoothly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 604

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTNENANCE PROGRAM

DUTY TITLE: Small Engine Related Duties

JOB TASK: Prepare engine for winter storage

TASK NO: 605

STUDENT WILL: Condition gasoline engine for winter storage

GIVEN: A small gasoline engine, tools and supplies.

TOOLS & EQUIPMENT: open end wrench set, spark plug wrench, oil drain pan, and fresh crankcase oil

TASK STEPS:

1. Turn on engine and run motor a few minutes until it is warm.
2. Drain (empty) crankcase oil.
3. Remove spark plug and pour 2 tablespoons of fresh oil into spark plug hole.
4. Pull starter on engine several times to cover cylinder walls with oil.
5. Replace spark plug.
6. Drain gas tank or put stabilizer in gasoline as indicated.
7. Place engine inside a dry storage area.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: An owner's service and Maintenance guide.

LEARNING ACTIVITIES

1. Read all information listed in Task# 605. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

4. Fill-out checklist to see if you have completed Task# 605 correctly. See Student Evaluation Checklist in this guide.

5. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student drain crankcase oil after engine was warmed?		
2. Did student put oil in spark plug hole?		
3. Did student cover cylinder walls with oil?		
4. Did student drain gasoline tank or add stabililzer to gasoline.		
5. Did student put engine in a dry storage area?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 605

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENACE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Do a maintenance check of a fork lift truck then move heavy equipment using truck

TASK NO: 700

STUDENT WILL: Do a maintenance check of a fork lift truck then move heavy equipment using truck

GIVEN: Fork lift truck and heavy equipment to move.

TOOLS & EQUIPMENT: NONE

TASK STEPS:

1. Check water, oil, and hydraulic fluid.
2. Be sure L.P. tank clamp is tied.
3. Tighten L.P. hose connections.
4. Open L.P. tank valve slowly.
5. Check brakes as indicated.
6. Start truck engine.
7. Check forward and reverse.
8. Check fork lift and tilt (incline).
9. Adjust width on forks for the size of equipment you are going to lift.
10. Lift load (equipment) only a few inches off the floor and tilt forward.
11. Put truck in reverse and back up. Turn truck in the direction you are going to go.
12. Move load to new location.
13. Position load down on floor in new location and tilt the forks forward.
14. Bring forks down along sides of load and back away (move back) from load.
15. When finished moving equipment, move forks apart (separate) and bring them down to floor.
16. Turn off engine and close L.P. tank valve.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: NONE

LEARNING ACTIVITIES

1. Read all information listed in Task# 700. See Compteency Sheet in this guide.
2. Ask teacher to demonstrate this task. See teacher.
3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."
4. Fill-out checklist to see if you have completed Task# 700 correctly. See Student Evaluation Checklist in this guide.
5. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student check water oil and hydraulic fluid as indicated?		
2. Did student check the L.P. tank clamp as indicated?		
3. Did student tighten the L.P. hose connections?		
4. Did student open the L.P. valve properly?		
5. Did student check the operation of truck as indicated?		
6. Did student check the fork lift controls as indicated?		
7. Did student adjust the width on forks for the size of the load?		
8. Did student lift properly?		
9. Did student move load to new location properly?		
10. Did student position the load in new location properly?		
11. Did student move truck away from load properly?		
12. When finished did student place forks in proper position before turning off engine?		
13. Did student close the L.P. tank valve?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 13
TOTAL POINTS POSSIBLE = 13

TASK# 700

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Perform routine maintenance to pool and filter equipment

TASK NO: 701

STUDENT WILL: Do routine maintenance on a swimming pool and filter equipment

GIVEN: A swimming pool, equipment and supplies

TOOLS & EQUIPMENT: filter recharging sand, or diatomaceous earth, pool vacuum, leaf net, and liner brush

TASK STEPS:

1. Use leaf net to remove all debris (dirt leaves, etc.) from surface of pool. See pg. 701-1 in this guide.
2. Brush the inside walls of pool with liner brush.
3. Remove and empty catch basket from inside skimmer.
4. Turn off pump, remove and empty hair and lint filter basket.
5. Connect hoses to pool vacuum brush.
6. Prime (fill) hose with water.
7. Connect to pump return inlet and vacuum the floor of the pool.
8. Turn "back flush" handle on filter so that water drains out through filter. Use the hose to drain water to a satisfactory location.
9. Turn "service" handle on filter.
10. Add 2 or 3 pounds of diatomaceous earth to skimmer as indicated to recharge filter, see pg. 701-2 in this guide.
11. Turn pump on.

EVALAUTION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it-Yourself Manual Reader's Digest, 1st Ed., 1977

LEARNING ACTIVITIES

1. See picture of swimming pool and components. See pg. 701-1 and 701-2 in this guide.

2. Read all information listed in Task# 701. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 701 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher the completed Student Evalaution Checklist to check.

STUDENT EVALUAITON CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student remove debris from pool surface with leaf net?		
2. Did student brush the inside walls of pool as indicated?		
3. Did student empty the catch basket?		
4. Did student empty the lint filter basket after turning off the pump?		
5. Did student vacuum the floor of pool?		
6. Did student turn back flush handle on filter to drain water?		
7. Did student drain water from filter to a satisfactory location?		
8. Did student recharge filter as indicated?		
9. Did student turn on pump when work was completed?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 701

Pools and equipment

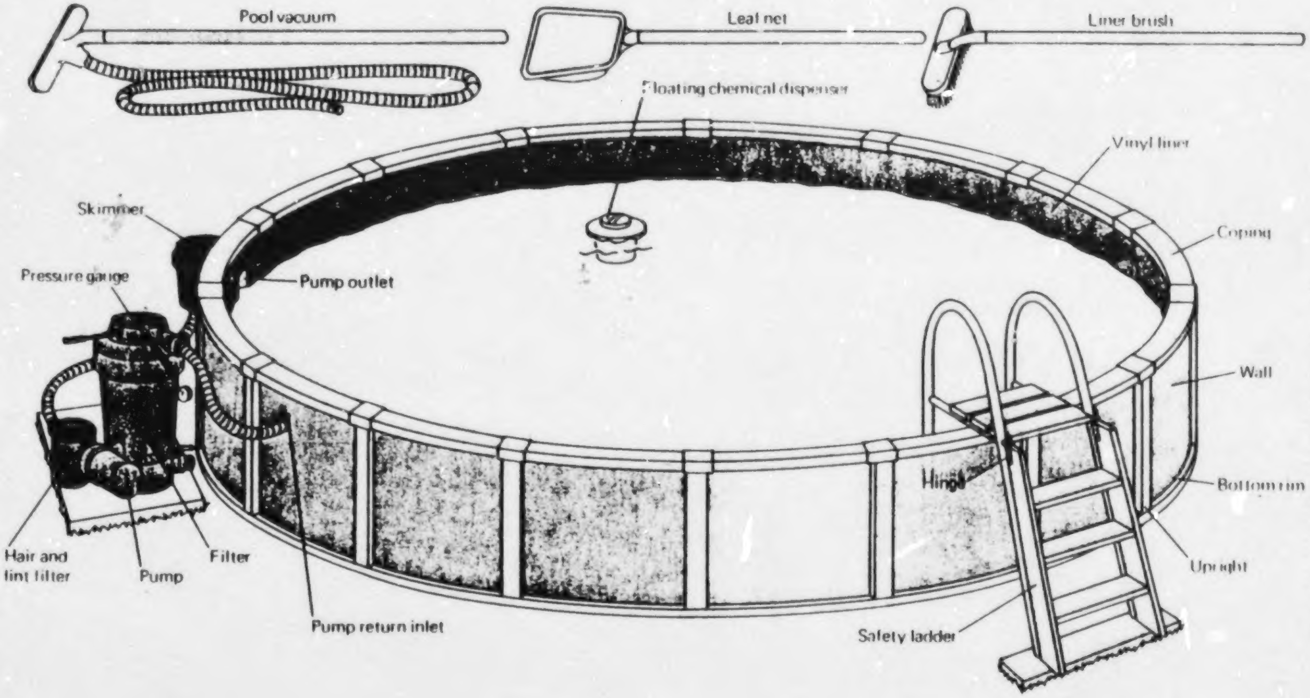
Buying considerations

Above-ground swimming pools are more widely owned than in-ground pools for a number of reasons: They are relatively inexpensive; they can be installed by a do-it-yourselfer; they can be taken down and reassembled should the owner move; and they are normally not subject to the problems of frost heaves that can affect in-ground pools in many parts of the country. Furthermore, in many areas taxes and insurance rates are lower for above-ground pools than for in-ground pools. This section deals mostly with above-ground pools.

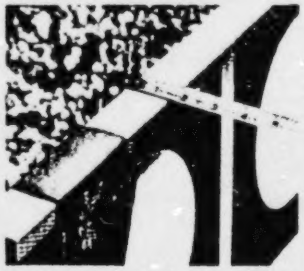
Before shopping for a pool, check your local building codes. Some communities ban above-ground pools outright, others subject them to discouraging building code restrictions. You may need building, plumbing, or electrical permits; inspections; an occupancy certificate, a new property survey; or protective fencing. A pool may have to be set back a minimum distance from your property line.

The framework of an above-ground pool should be made entirely of aluminum—even the nuts and bolts. Otherwise it may weaken from corrosion. Wood, even redwood, will rot and split in time, especially when exposed to pool chemicals. Steel rusts; painted or coated steel will inevitably be scratched during assembly, and rust will set in. A weakened frame will eventually burst: Bathers may be swept over the jagged edges and injured; thousands of gallons of chemically-treated water will be released onto your property and perhaps onto neighbors' property or into the local water system. Lawsuits may result.

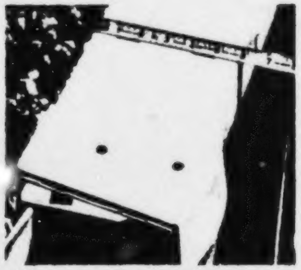
Pool uprights and coping should be aluminum extrusions at least 4 to 6 inches thick for maximum strength. Curved coping is stronger than straight coping; it also overhangs the pool less, so that swimmers are not likely to bump their heads on it. The pool liner should be of at least 20-gauge vinyl.



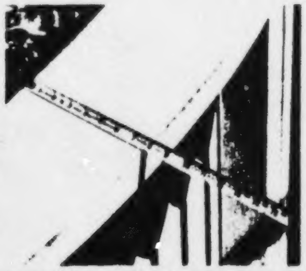
Types of pool construction



Inexpensive pools have frame uprights and coping made of sheet metal stampings less than 2 in. thick. Strength is marginal, even on the smallest (under 16-ft) pools.



Moderately priced pools have extruded uprights and coping that are at least 6 in. thick. Frame will withstand surging of pool water; coping is wide enough to sit on.



Expensive pools have 6-in. uprights and curved coping 8 in. thick. The coping is clad in vinyl to make it less slippery than painted metal. It should withstand years of use.

This 28-ft. round pool collapsed after four years of use when the steel frame and bolts were weakened by rust. More than 16,000 gallons of water escaped in a few minutes.

Resource #1 Fix-it-Yourself Manual
Reader's Digest, 1st.
Ed., 1977, pg.456

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Sand filter service

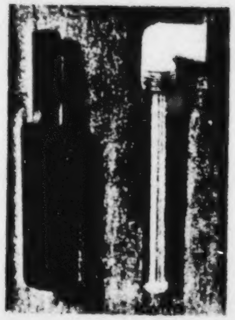
A sand filter traps dirt and some other impurities by passing the pool water through a foot or more of special fine filter sand, then through a limestone filtering element. When the filter becomes saturated with dirt, water flow will be restricted and back pressure will rise above the normal level--usually 15 pounds per square inch (psi). This may happen immediately after vacuuming the pool (the vacuum hose is attached directly to the skimmer or pump inlet) or after treating it to eliminate algae. The filter must then be backflushed.

1. Check pressure gauge every day and shortly after you vacuum or add chemicals to pool. When the pressure exceeds the level recommended by the filter manufacturer (in this case 15 psi), shut off pump motor.

2. Adjust the directional valve to the *Backflush* or *Backwash* setting and turn on the pump. This reverses the normal flow of water through the filter. Shut off pump when water leaving waste hose turns clear.

3. Check the sand inside the drum occasionally. If the top levels contain embedded debris that cannot be flushed out, remove the dirty sand. Dry it and sift out debris, or replace ½ with new sand. Remove all sand before moving filter indoors for winter storage.

4. If sand and dirt are being pumped into the pool at the return inlet, the filter stone is cracked. Remove sand and unscrew the filter stone. Replace it with a new one from a pool dealer.

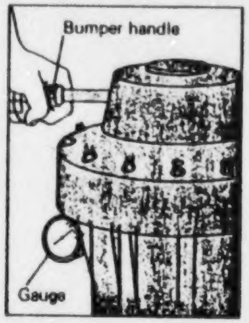


5. There are two kinds of filter stones. Genuine limestone (left) can be cracked in transit or during installation. New plastic ''stones'' (right) are less fragile. Both keep sand from being pumped into pool.

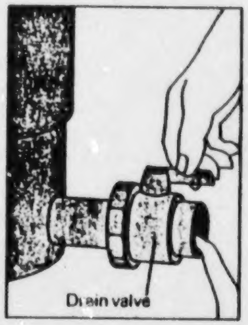
6. Screw new stone into place and pour sand carefully around it. Do not dump sand directly onto a limestone filter or it may crack. Seal lip on cover with petroleum jelly, attach hoses, and put filter back into operation.

Diatomite earth filter service

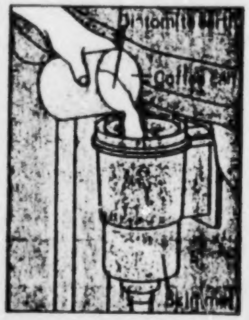
This type of filter uses a fine powder called diatomite earth as a filtering medium. The flow of water through the filter deposits this earth evenly over a number of mesh tubes. When the tubes become clogged with dirt, simply turn off the pump and bump the tubes up and down to dislodge and redistribute both the dirt and the diatomite earth. There is no need to backflush the unit. After several clogging and bumping cycles, the filter will reach a saturation point; it must then be drained, and the diatomite earth replaced with a new supply.



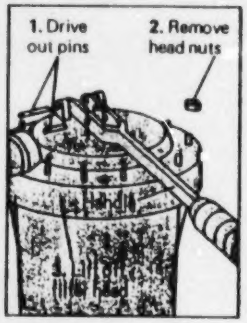
1. When the pressure gauge on the filter reads 7 to 10 psi more than normal, stop pump. Move bump handle down slowly, then up briskly. Repeat three times, then restart pump. Pressure should drop to start-up level.



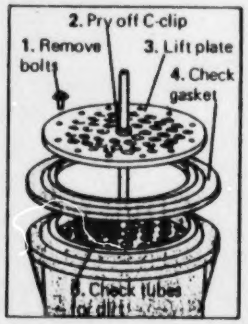
2. If pressure rises 10 psi within 24 hours of the last bumping operation, stop the pump. Move bump handle down slowly, then up briskly 9 or 10 times, then drain water and earth from unit.



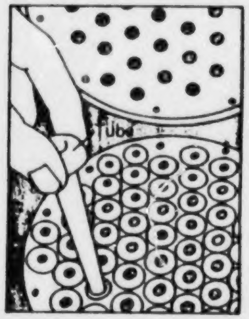
3. Let some pool water run through filter to flush out remaining dirt. Fill unit with pool water and repeat Step 2. Close drain valve, start pump, and add 4 lb of diatomite earth (about 6 level 1-lb coffee cans full) through the skimmer.



4. If dirt and diatomite earth are being pumped into the pool at the return inlet, the diaphragm gasket or one or more mesh tubes are leaking. Stop pump. Drain filter and close all valves. Remove filter head and bump handle.



5. Separate tube retaining plates and check diaphragm gasket for wear, rips, or holes. Replace the gasket if it is defective. Look down each mesh tube. If the inside is dirty, the tube is leaking.



6. Pull out and replace leaking mesh tubes. If no tubes are leaking and the gasket is sound, the retaining plates were not tight. Coat bump shaft with petroleum jelly, align all tube holes and reassemble filter. Tighten all bolts securely.

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COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Add chemicals to water in swimming pool

TASK NO: 702

STUDENT WILL: Put chemicals in water of pool to bring water into correct chemical balance

GIVEN: A swimming pool, equipment, and supplies.

TOOLS & EQUIPMENT: pool water test kit chlorine (tablets or liquid) muriactic acid and sodium bisulfate

TASK STEPS:

1. Rinse test tube in clean water.
2. Fill test tube to the line with pool water.
   NOTE: Go 18 inches below the surface of water to fill tube.
3. Add phemol red to chlorine side of tester. Put in the amount listed on test kit. See Information Sheet 702-1 in this guide.
   NOTE: The best time to put chemicals in the water is in the early evening.
4. Add other test reagent to pH side of tester. Put in the amount listed on test kit package.
5. Cover both tubes with caps and shake tester until the color of liquid is uniform (even colored).
6. Match test sample colors to color chart on tester kit.
7. Add recommended chlorine to pool water if chlorine level is low.
   CAUTION: Be careful not to drop chlorine of acid on yourself. If you do, rinse immediately with water.
8. Add recommended muriactic acid or sodium bisulfate to pool water if pH is high or low.
9. Let the pump on pool run for one hour to circulate the water in pool then take another water test sample.
10. Add more chemicals to the pool if necessary to get a correct chemical balance.
11. Rinse the pool test kit in clean water and put pool chemicals in a safe place where children cannot reach.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it-Yourself Manual-Reader's Digest, 1st Ed., 1977 A Pool Owner's Manual

LEARNING ACTIVITIES

1. Look at picture and read description of a pool water test kit. See Information Sheet 702-1 in this guide.

2. Read all information listed in Task# 702. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 702 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING YES	 NO
1. Did student rinse test tube before using it?		
2. Did student get the pool water sample from 18 inches below the surface of the water?		
3. Did student add the test reagents to tester as indicated?		
4. Did student match the color of the water sample to color chart correctly?		
5. Did student put in the correct amount of chlorine, muriactic acid or sodium bisulfate to pool water?		
6. Did student work with chemicals in a careful and safe way?		
7. Did student put chemicals in a safe place when finished?		

TOTAL POINTS EARNED =

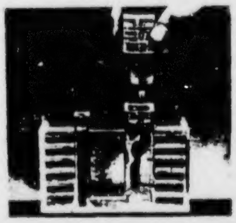
POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 702

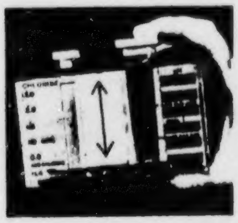
INFORMATION SHEET 702-1

Using the test kit

Several brands of chlorine and pH test kits are sold by pool dealers. Buy one that is easy to read accurately. Fill the test tube to the line with pool water obtained at least 18 inches below the surface and away from the pump inlets. Do not test water immediately after adding chemicals to the pool; let the pump run for at least six hours before testing. Buy fresh test reagents at the start of each swimming season; discard phenol red reagent if it develops an orange cast. Discard pool water samples after testing; do not pour them back into the pool.



1. Rinse test tube in pool, then fill to line. Add specified amount of reagent. Hold bottle vertically and squeeze slowly to obtain drops of the correct size.



2. Cap tube, shake. Do not cover tube with your finger; skin oils will affect readings. Match test colors to shade of sample to determine pH or chlorine level.

How to correct undesirable water conditions*

Problem	Action
Water stings eyes Pool liner stained Aluminum pool parts corrode	Test pH level. If low, sow soda ash granules into pool with pump running. Do not use high pH laundry bleach or inorganic chlorine granules in pool; use only stabilized, organic chlorine products
Scale formations on heater coils, pipes, pool parts Pool liner bleached Rapid filter clogging Heavy chlorine demand Cloudy water	Test pH level. If high, add 1 pint of muriatic acid or sodium bisulfate to a bucket of water; add to pool with pump running; allow to circulate overnight. Test pH next day. Add more muriatic acid or sodium bisulfate if needed, but no more than 1 pint per day
Cloudy water	When caused by abnormal amounts of wind-blown dirt and other nonfilterable wastes, add oxidizing agent or 5-10 times normal daily chlorine dose to bucket of water; pour into deep end of pool; run pump for 12 hours For red-brown iron oxide buildup, follow procedure given above but run pump for 48 hours; then, vacuum up particles that have settled on bottom When accompanied by a green algae scum, follow procedure above, but sow chemicals directly over algae deposits. Vacuum up dead algae after 12 hours When accompanied by black or blue-green algae deposits, brush algae buds vigorously. Stop pump. After 4 hours, sow algecide granules over algae deposits. After 12 hours, start pump, brush and vacuum algae If none of the above apply, bring a sample of pool water to a dealer with a testing lab. Follow dealer's instructions. If too much stabilizer has been added, partially drain pool and dilute with tap water

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*Do not backflush filter or swim in pool during treatment period. If repeated treatment does not solve the problem, consult a professional pool maintenance service or a pool dealer with a testing laboratory

Resource #1
Fix-it-Yourself Manual
Reader's Digest, 1st Ed.,
1977, pg. 458

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Strike an arc using metal arc welding equipment

TASK NO: 703

STUDENT WILL: Practice striking (forming) an arc (electric spark) using metal arc welding equipment

GIVEN: Electric arc welding equipment, and equipment.

TOOLS & EQUIPMENT: shielded metal arc welding machine electrodes, welding helmet, welding gloves, proper clothing steel practice plates

TASK STEPS:

1. Connect grounding cable to steel work table, (see pg. 703-1 in this guide).
2. Set welding machine to proper amperage as indicated.
3. Put on welding helmet, gloves and proper clothing.
4. Clamp welding electrode into holder.
5. Turn on welding machine and lower front of helmet.
6. Practice striking arc by both the peck and scratch method, (see pg. 703-2 in this guide.)
7. When an arc is established push electrode toward steel plate to maintain (keep) a 1/8 inch gap (opening) between the electrode and the steel plate.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Learning guide from Lake County Area Vocational School
Welding Skills and Practice-Gianchino-Weeks, American Technical Pub., 1976

LEARNING ACTIVITIES

1. Look at pictures of welding circuit and methods of striking an arc. See pgs. 703-1 and 703-2 in this guide.
2. Read all information listed in Task# 703. See Competency Sheet in this guide.
3. Ask teacher to demonstrate this task. See teacher.
4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
5. Fill-out checklist to see if you have completed Task# 703 correctly. See Student Evaluation Checklist in this guide.
6. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

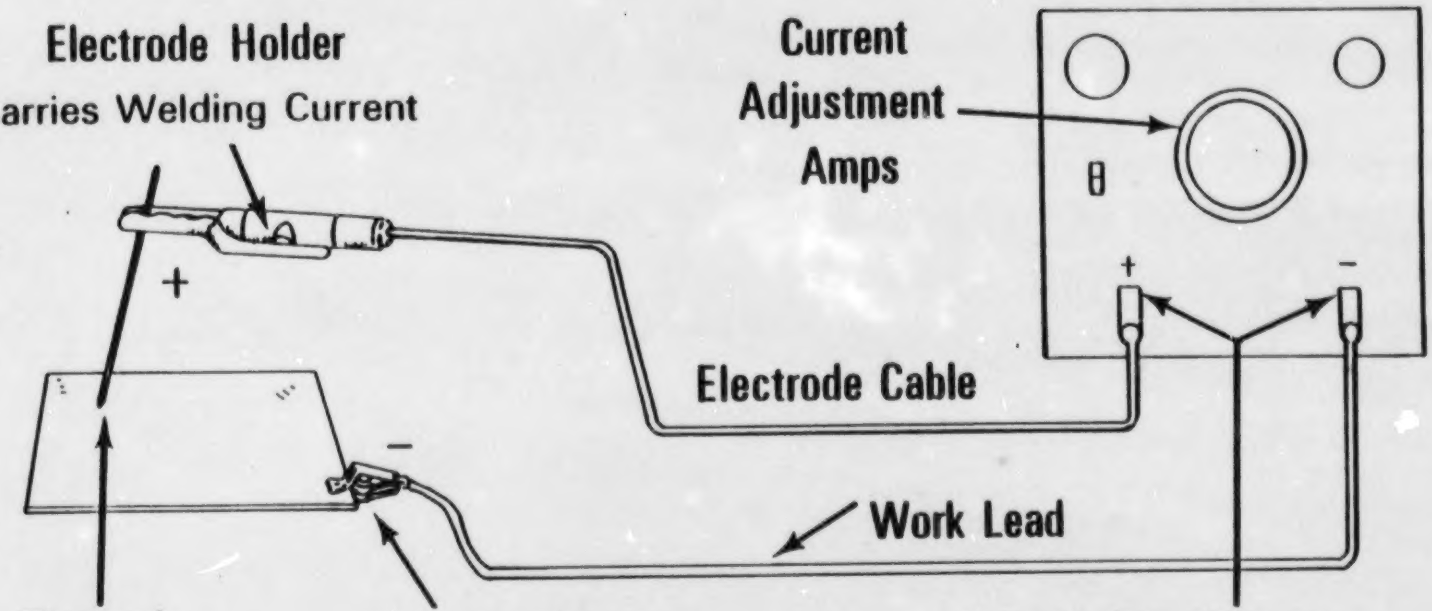
ITEM TO BE CHECKED	RATING	
	YES	NO
1. Did student connect grounding cable properly?		
2. Did student set amperage on welding machine properly?		
3. Did student wear the necessary safety equipment?		
4. Did student make a welding arc?		
5. Did student maintain a 1/8 inch gap between electrode and steel plate indicated?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 5
TOTAL POINTS POSSIBLE = 5

TASK# 703

Welding Circuit



Welding Machine

Electrode Holder

Carries Welding Current

Current Adjustment Amps

Electrode Cable

Work Lead

Electrode

Diameters:
1/16 - 5/16 x 14'
Most Common Length

Grounded Work

Completes Welding Circuit

Polarity-D.C. Current

Reverse:

1. Electrode (+)
2. Current flows from work to electrode
3. 2/3 heat at (+) electrode
   1/3 heat at (-) work

Straight:

1. Electrode (-)
2. Current flows from electrode to work
3. 2/3 heat at (-) work
   1/3 heat at (+) electrode

Resource: Learning guide Lake County Vocational School

INFORMATION SHEET 703-1

METHODS IN STRIKING A WELDING ARC 703-2

84 *Shielded Metal–Arc Welding*

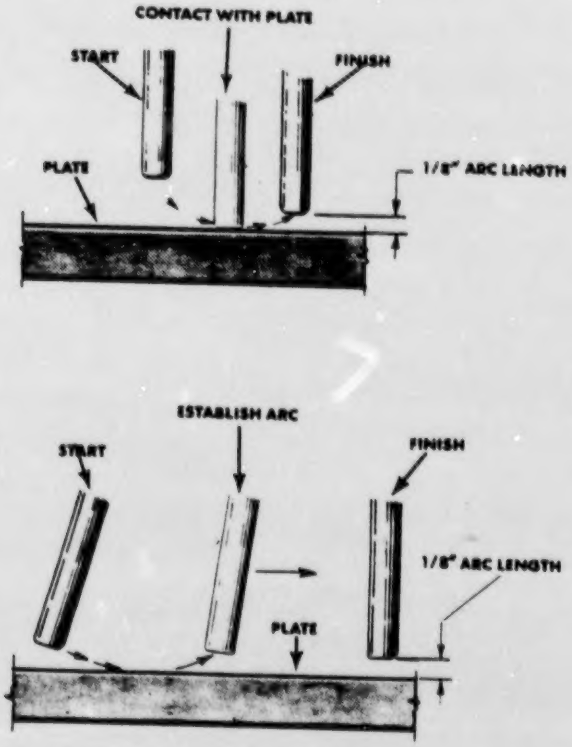

CONTACT WITH PLATE
START
FINISH
PLATE
1/8" ARC LENGTH
ESTABLISH ARC
START
FINISH
1/8" ARC LENGTH
PLATE

Fig. 7-2. There are two methods of starting, or striking, a welding arc.

Welding Skills and Practice
Gianchino-Weeks, American Technical Pub,
1976 pg.84

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Weld two pieces of steel together

TASK NO: 704

STUDENT WILL: Weld two pieces of steel together by running continuous welding beads

GIVEN: Two pieces of steel, equipment and supplies

TOOLS & EQUIPMENT: shielded electic arc welding machine electrodes, welding helmet, welding gloves and clothing, two steel plates, chipping hammer, and wire brush

TASK STEPS:

1. Connect grounding cable to steel work table.
2. Set welding machine to proper amperage.
3. Put on welding helmet, gloves and clothing.
4. Clamp the electrode in holder.
5. Clamp the two pieces of steel plates together. Leave a 1/16 inch gap between the two ends of steel plates.
6. Turn on welding machine and lower helmet.
7. Tack the two ends of steel together using welding electrode as indicated.
8. Remove clamps from steel plates.
9. Now, weld steel plates together firmly. Be sure you have the:
   a. Correct electrode
   b. Correct arc length
   c. Correct current
   d. Correct travel speed
   e. Correct electrode angle
10. Chip the welded steel with chipping hammer.
11. Brush the welded steel with a wire brush.
12. Compare the welding job you have finished with picture on pg. 704-2 in this guide.
13. Correct any welding defect by repeating welding procedure as indicated on pg. 704-2 in this guide.
14. Complete another continuous welding bead.
15. Continue to practice welding until a good weld is made.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Shielded Metal Arc Welding - Unit 11 Lake County Area Vocational School

LEARNING ACTIVITIES

1. Read new words that are going to be presented in the task. Information Sheet 704-1 in this guide.
2. Look at picture of proper and improper (wrong) welding beads. See pg. 704-2 in this guide.
3. Read all information listed in Task# 704. See Competency Sheet in this guide.
4. Ask teacher to demonstrate this task. See teacher.
5. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".
6. Fill-out checklist to see if you have completed Task# 704 correctly. See student Evaluation Checklist in this guide.
7. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE TYPED	RATING	
	YES	NO
1. Did student connect grounding cable properly?		
2. Did student set welding machine to proper amperage?		
3. Did student wear the proper safety equipment and clothes?		
4. Did student clamp the two pieces of steel together properly?		
5. Did student tack the two ends of steel properly?		
6. Did student weld the two ends of steel plates firmly together?		
7. Did student follow the correct procedure when welding the steel plates together?		
8. Did student compare the finished job with picture on pg. 704-2 in this guide?		
9. Did student finish with a good quality continuous weld on steel plates?		

TOTAL POINTS EARNED=

POINTS NEEDED FOR MASTERY = 9
TOTAL POINTS POSSIBLE = 9

TASK# 704

INFORMATION SHET 704-1

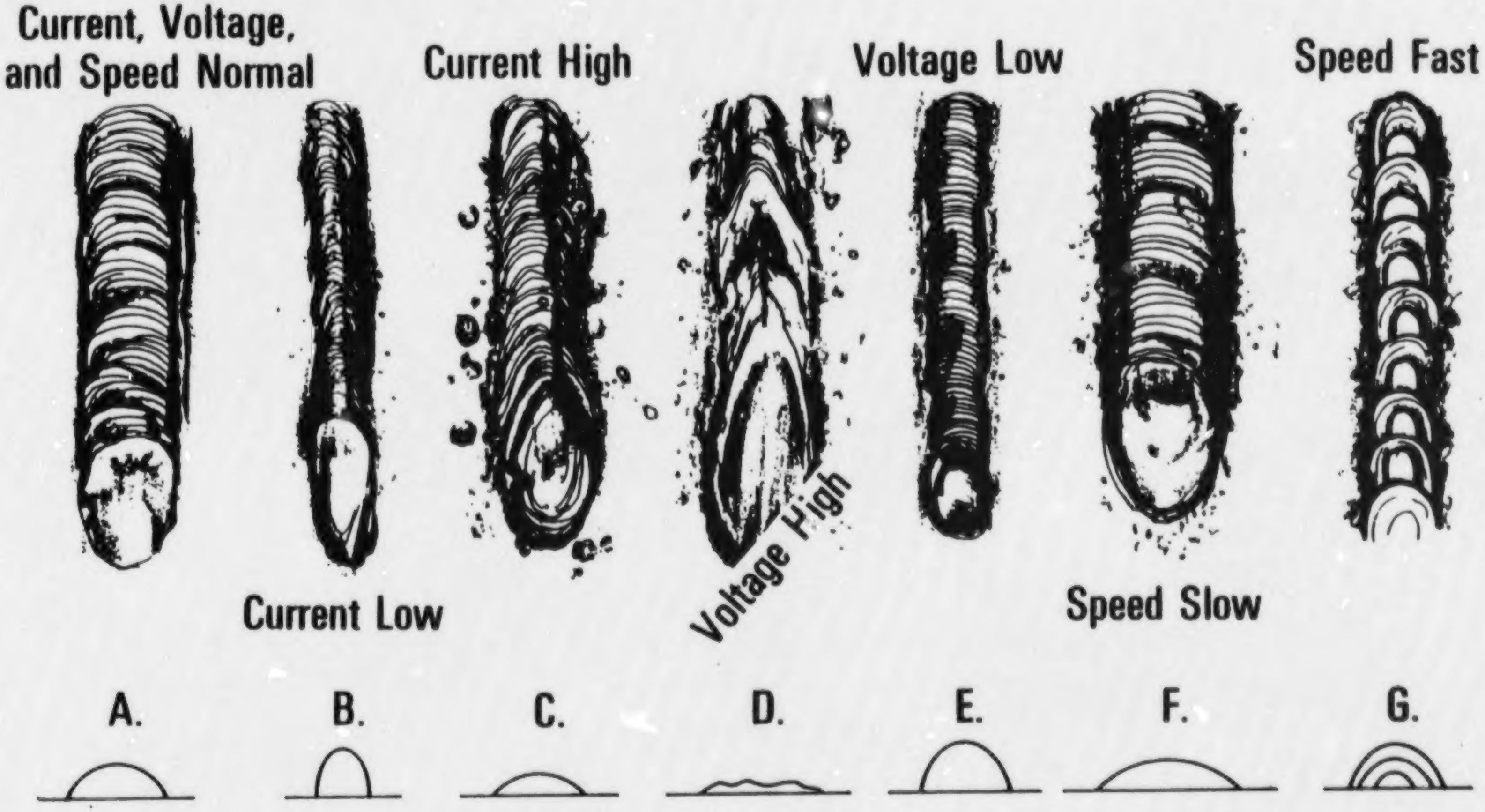
STUDY WORDS:

defect	- not perfect
continuous	- unbroken, continuing
apparel, clothing	- clothes, things you wear
holder	- something that holds an object
gap	- separation, opening, or space
travel speed	- how fast something is moving
helmet	- a metal hat
procedure	- process
welding bead	- a very small ball of welding material

VERBS:

to lower	- to bring down
to tack	- to join or attach together lightly using welding material
to weld	- to attach together metal parts by heating them and letting the metals flow together

Properly and Improperly Formed Beads


Current, Voltage, and Speed Normal
Current Low
Current High
Voltage High
Voltage Low
Speed Slow
Speed Fast
A.
B.
C.
D.
E.
F.
G.

BEST COPY AVAILABLE

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Set up and adjust flame on oxy-acetylene equipment then flame cut a piece of steel

TASK NO: 705

STUDENT WILL: Set up oxy-acetylene equipment, adjust flame on torch, and cut a piece of steel using flame cutting torch

GIVEN: oxy-acetylene equipment and steel to cut.

TOOLS & EQUIPMENT: oxygen tank, acetylene tank, pressure regulators, hoses, flame cutting torch, steel, welding gloves and goggles (eyeglasses), spark lighter, regulator wrench, torch tip, tip cleaners, soap, and water

TASK STEPS:

1. Put chain around cylinders and attach firmly to cylinder cart, (see Information Sheet 705-1 in this guide).
2. Remove protector cap and open cylinder valve for a moment to clean out the outlet nozzle, (see picture #1 on Information Sheet 705-2 in this guide).
3. Attach regulators to cylinders and hoses to regulators. Connect green or black hose to oxygen cylinder and red hose to acetylene cylinder.
   NOTE: Turn oxygen hose connection to the right to screw on. Turn acetylene hose connection to the left to screw on. (see Information Sheet 705-1 in this guide).
4. Check adjusting screws on regulator. They should be unscrewed to the point where they turn easily.
5. Open cylinder valve slowly then blow out any dirt from the hoses by quickly opening and then closing regulator screws.
6. Connect hose to the torch. Turn oxygen hose connection to the right to screw on. Turn acetylene hose connection to the left to screw on.
7. Test all hose and regulator connections for leaks by opening regulators to operating pressure. Be sure needle valves on torch are closed. See picuture #2 on Information Sheet 705-2 in this guide.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTNENANCE PROGRAM
(CONTINUED)

TASK NO: 705

TASK STEPS:

8. Test each connection with a soap and water solution.
   NOTE: bubbles indicate a leak.
9. Select and attach a torch tip to torch.
10. Adjust oxygen and acetylene pressures as indicated.
11. Open acetylene tank valve 1/4 turn.
12. Light the acetylene gas with spark lighter.
13. Adjust acetylene gas flame to a length of 10 inches.
14. Turn on high pressure oxygen and adjust for a neutral flame. See Information Sheet 705-3 in this guide.
15. Start the flame cut at the edge of the steel plate.
   NOTE: Heat steel until very hot (red hot) and then turn on high pressure oxygen.
   CAUTION: Be sure to wear welding goggles and gloves.
16. Move torch slowly across steel plate and hold down high pressure oxygen lever. See picture #2 on Information Sheet in this guide.
17. Keep the inner cone (middle section) of flame about 1/16 inch above steel plate.
18. Turn off high pressure oxygen when cut is finished.
19. Turn off torch by turning acetylene off first and then the oxygen.
20. Shut down equipment by turning off oxygen and acetylene at tanks.
21. Turn lever on each regulator to the left as indicated.
22. Disconnect regulars, hoses and torch.
22. Replace protector cap on each cylinder.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual

LEARNING ACTIVITIES

1. Look at pictures of equipment you are going to use in this task. See Information Sheets 705-1, 705-2, 705-3 in this guide.

2. Read all information listed in Task# 705. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

5. Fill-out the checklist to see if you have completed Task# 705 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student put chain around cylinders and connect to cart properly?		
2. Did student open cylinder valves to clean out the outlet nozzle properly?		
3. Did student attach regulators to tanks properly?		
4. Did student turn on tank valves slowly?		
5. Did student open each tank to the correct setting?		
6. Did student connect hoses properly?		
7. Did student attach torch tip properly?		
8. Did student adjust regulators for correct amounts of pressure?		
9. Did student adjust regulators for a neutral flame correctly?		
10. Did student flame cut the steel properly?		
11. Did student shut off the flame properly?		
12. Did student shut off all equipment properly?		
13. Did student wear the proper safety equipment?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 13
TOTAL POINTS POSSIBLE = 13

TASK# 705

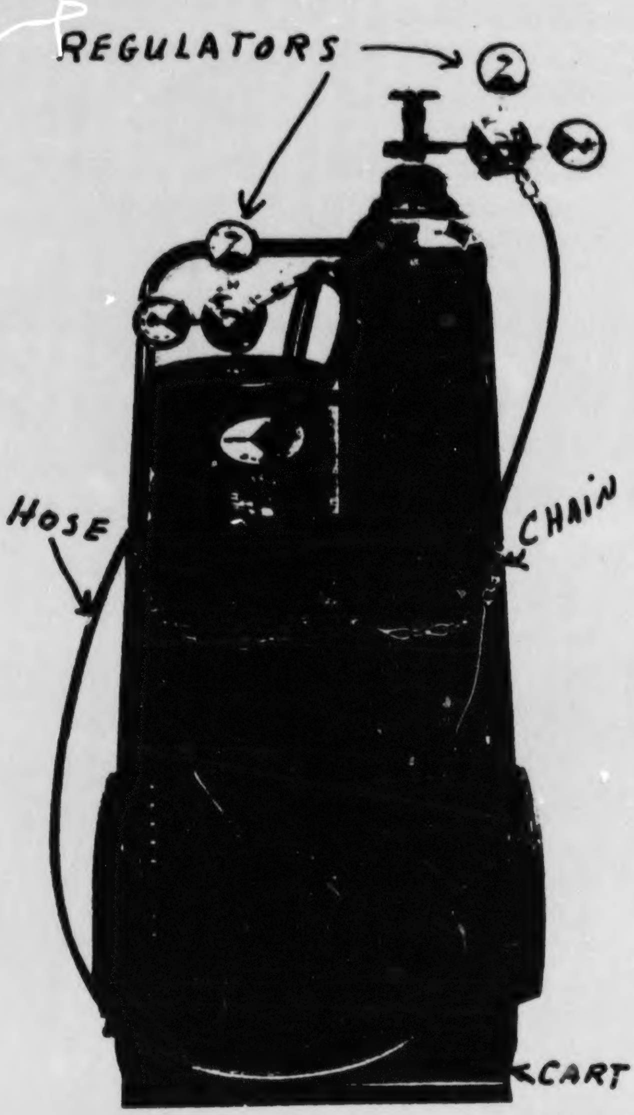


Figure 5-7. A welding unit on a hand truck permits transporting the unit to where the welding job is to be done. (*Linde Company*)

Resource# 1
Welding Skills-Giachino
Weeks, American Technical Pub., 1976 pg
51,54,55, 256

INFORMATION SHEET 705-2

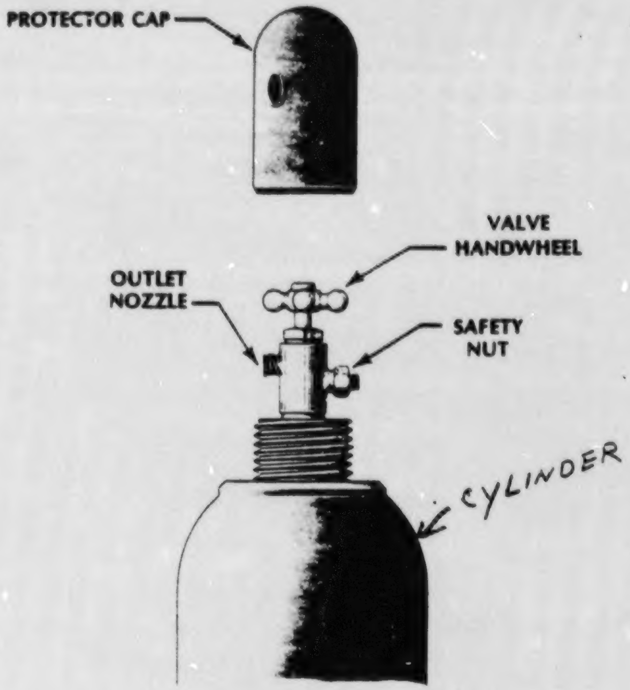

PROTECTOR CAP
VALVE HANDWHEEL
OUTLET NOZZLE
SAFETY NUT
CYLINDER

Figure 5-2. A protector cap protects the high-pressure valve of the oxygen cylinder when the cylinder is not in use. (*Linde Company*)

PICTURE #1

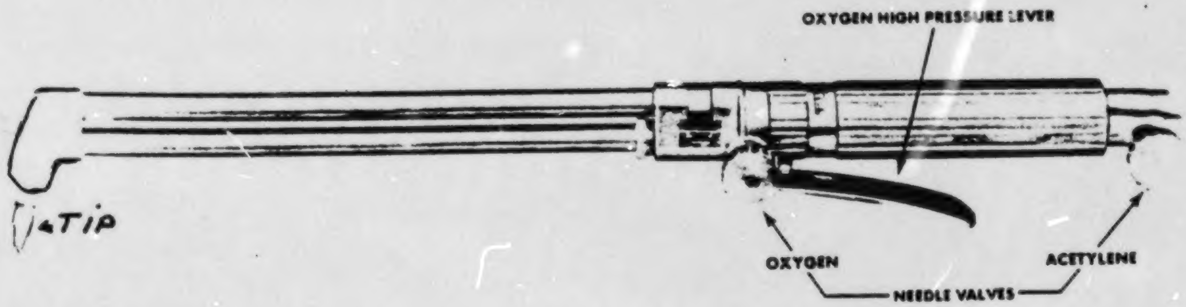

OXYGEN HIGH PRESSURE LEVER
TIP
OXYGEN
ACETYLENE
NEEDLE VALVES

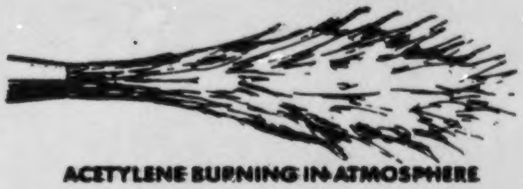
Fig 33-5. A flame-cutting torch with one oxygen needle valve (left) and one acetylene needle valve (right). (Linde Co.)

PICTURE #2

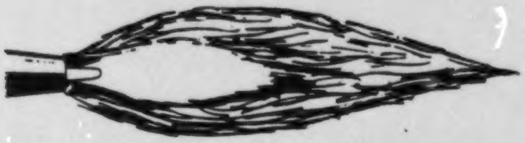
Resources continued

INFORMATION SHEET 705-3

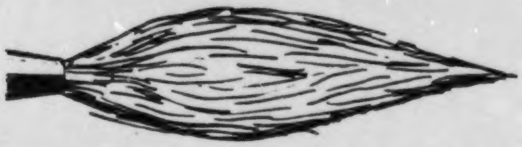
STEPS IN ADJUSTING FOR A NEUTRAL FLAME



ACETYLENE BURNING IN ATMOSPHERE



EXCESS OF ACETYLENE



NEUTRAL FLAME

Resource# 1 continued

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Do maintenance procedures on hot water electric heater

TASK NO: 706

STUDENT WILL: Do prevention maintenance procedures on a hot water heater

GIVEN: A hot water heater, tools and equipment.

TOOLS & EQUIPMENT: adjustable wrench, pipe wrench, water hose, gas leak detector, screwdrivers, V.O.M. electrical meter with millivolt range, bucket and flashlight

TASK STEPS:

1. Remove control access panel.
2. Light pilot flame. (Follow instructions on inside of access panel).
3. Check all gas line connections for gas leaks using gas leak detector or a solution of water and soap.
4. If pilot flame does not stay on, check voltage output of thermocouple. It should read at least 18 milivolts. Replace thermocouple if necessary.
5. Turn on gas valve to "on" position. Burner should light.
6. Adjust thermostat to range indicated. Be sure cold water supply valve is open.
7. Look for water leaks at burner in any hot water faucets.
8. Let the water heat in tank (heater) for 30 minutes.
9. If heater makes noises (sounds) turn off heater, and shut off cold water supply valve.
10. Drain water from tank.
11. Fill hot water tank again.
12. Light pilot flame.
13. Turn on heater.
14. Replace control access panel.

EVALAUTION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Owner's Manual for hot water heater

LEARNING ACTIVITIES

1. Look at pictures of hot water heater and parts. See your textbook pg. 241. Also se the owner's manual for the hot water heater.

2. Read all information listed in Task# 706. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat wht the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 706 correctly. See student Evaluation Checklist in this guide.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student check all gas line connections for gas leaks?		
2. If student light pilot flame correctly?		
3. Did student check voltage output of thermocouple?		
4. If necessary did student replace thermocouple?		
5. Did student turn on gas valve properly?		
6. Did student let the water in tank heat for 30 minutes?		
7. Did student open the cold water supply valve as indicated?		
8. Did student check burner and hot water faucets for leaks?		
9. If necessary did student drain water from tank properly?		
10. Does water heater operate properly now?		
11. Did student replace the control access panel on heater?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 11
TOTAL POINTS POSSIBLE = 11

TASK# 706

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Do service maintenance on a dishwasher

TASK NO: 707

STUDENT WILL: Do maintenance on an automatic dishwasher to be sure it is operating properly

GIVEN: An automatic dishwasher, tools and equipment.

TOOLS & EQUIPMENT: screwdrivers, small socket wrench set, V.O.M. electrical meter, test leads, clamp-on amperage meter, adjustable wrench and flashlight

TASK STEPS:

1. Check the incoming voltage at dishwasher using the V.O.M. meter.
2. Remove lower inspection cover and top control cover.
3. Check operation of door switch, water switch, and water level switch using the V.O.M. meter.
4. Check the amperage of drive motor while it is running.
5. Compare amperage of drive motor to amount of amperage printed on motor nameplate.
6. Check incoming water supply. Loosen (open) water line connection at water valve.
7. Inspect the other components of dishwasher. See "Wiring Diagram of Dishwasher" on pg. 707-2 in this guide. Also, see "Dishwasher Service Chart" in your textbook pg. 243.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete-Do-it-Yourself Manual-Reader's Digest, 1st Ed., 1977
Automatic Dishwasher Food Disposer and Trash Masher-Whirlpool Corp., 1978

LEARNING ACTIVITIES

1. See diagram of parts of a dishwasher. See Information Sheet 707-1 in this guide.

2. Read all information listed in Task# 707. See Competency Sheet in this guide. Also, see "Wiring Diagram of Dishwasher pg. 707-2 in this guide and "Dishwasher Service Chart" in your textbook pg. 243.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet in this guide. Be sure to follow all instructions in "Task Steps."

5. Fill-out checklist to see if you have completed Task# 707 correctly. See Student Evaluation Checklist in this guide.

6. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student determine the incoming voltage at dishwasher?		
2. Did student determine the incoming water supply to dishwasher?		
3. Did student remove inspection and top control covers properly?		
4. Did student check the working condition of switches indicated?		
5. Did student use wiring diagram and dishwasher service chart to inspect the other components of dishwasher?		
6. Did student check amperage of drive meter?		
7. Did student compare amperage of drive motor to amount indicated on motor nameplate?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 707

WASHING SYSTEM

This carefully engineered dishwashing system, FIGURE 29, cleans dishes, pots, glasses, silverware and cutlery by spraying them with a mixture of hot water and dishwasher detergent. A dishwasher tub does not fill with water the way a clothes washer does. It is designed so that there is never more than about 2.3 gallons (9.5 liters) of water in the dishwasher tub at any one time.

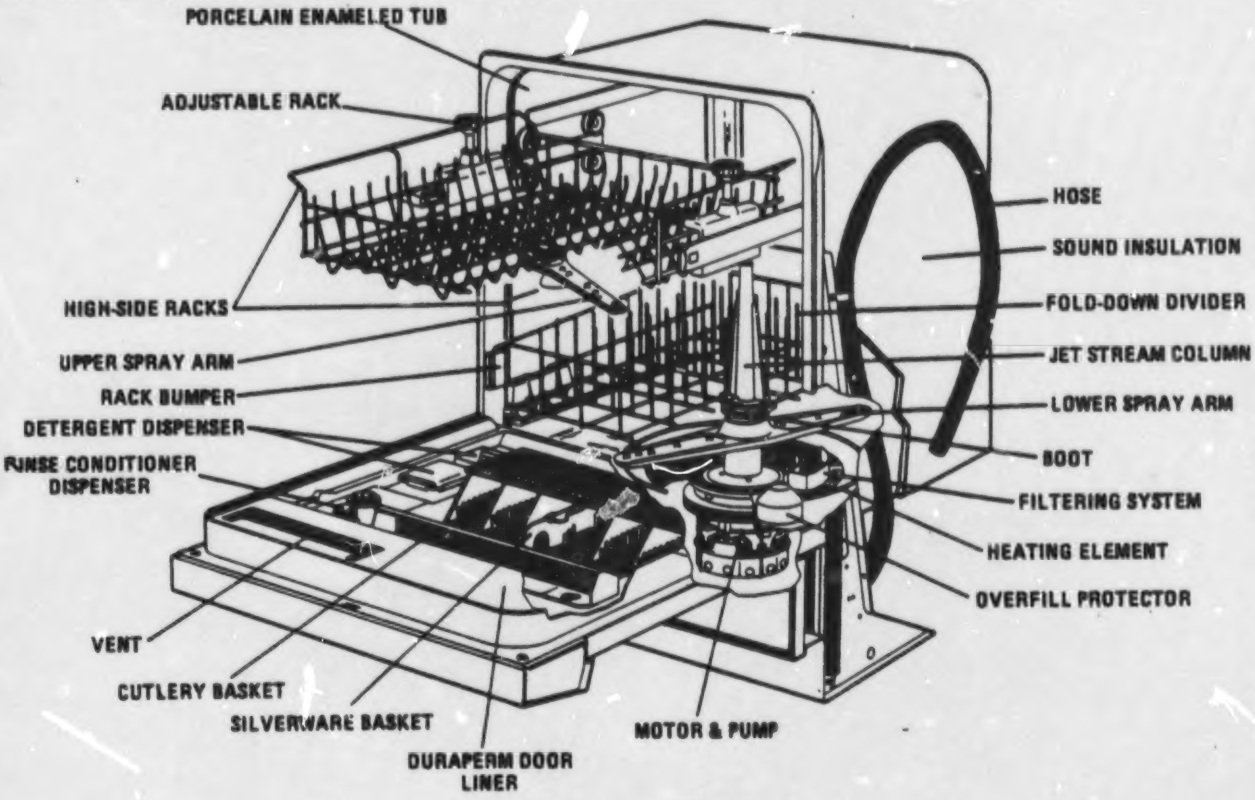
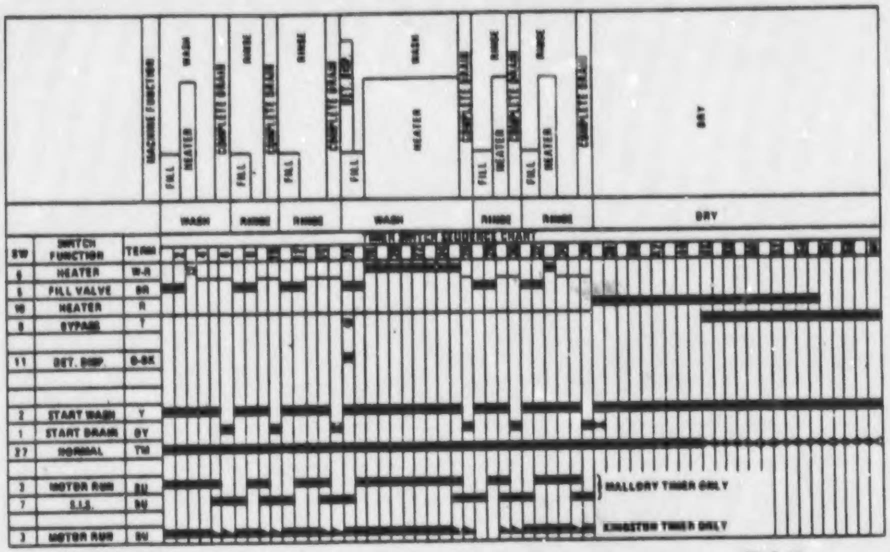

PORCELAIN ENAMELED TUB
ADJUSTABLE RACK
HIGH-SIDE RACKS
UPPER SPRAY ARM
RACK BUMPER
DETERGENT DISPENSER
RINSE CONDITIONER DISPENSER
VENT
CUTLERY BASKET
SILVERWARE BASKET
DURAPERM DOOR LINER
MOTOR & PUMP
HOSE
SOUND INSULATION
FOLD-DOWN DIVIDER
JET STREAM COLUMN
LOWER SPRAY ARM
BOOT
FILTERING SYSTEM
HEATING ELEMENT
OVERFILL PROTECTOR

FIGURE 29. Dishwasher cutaway.

Resource# 1
Automatic Dishwasher Food
Disposer and Trach Masher Compactor
Whirlpool Corp. 1978 pg. 17 and 39

WIRING DIAGRAM OF DISHWASHER - 707-2

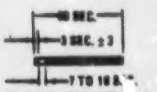

MACHINE FUNCTION
WASH
FILL
HEATER
COMPLETE DRAIN
RINSE
FILL
COMPLETE DRAIN
RINSE
FILL
COMPLETE DRAIN
WASH
FILL
HEATER
COMPLETE DRAIN
RINSE
FILL
HEATER
RINSE
FILL
HEATER
COMPLETE DRAIN
DRY
WASH
RINSE
RINSE
WASH
RINSE
RINSE
DRY
TIMER SWITCH SEQUENCE CHART
SW
SWITCH FUNCTION
TERM
6 HEATER W-R
5 FILL VALVE BR
10 HEATER R
8 BYPASS T
11 DET. DISP. O-BK
2 START WASH Y
1 START DRAIN GY
27 NORMAL TM
3 MOTOR RUN BU
7 S.I.S. BU
3 MOTOR RUN BU
MALLORY TIMER ONLY
KINGSTON TIMER ONLY

NOTE: "X" IS A MOMENTARY CLOSE AT BOTTOM OF ALL PUSHBUTTON EXCURSIONS EXCEPT CANCEL

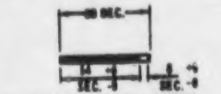
PUSHBUTTON POSITION	SELECTOR CIRCUIT CLOSED
SUPER WASH	N P S W V
RINSE & HOLD	N O R V
GENTLE WASH	N P S T W
RINSE & DRY	N P R W V
CHINA CRYSTAL	M P S T
SHORT CYCLE	M P S W
CANCEL	M O R

*1. Normal increment 60 seconds. Increment 30 will be of undetermined length due to thermostatic hold feature when "super wash" or "short cycle" is selected.

2. Sub-interval in seconds.


SEC.
3 SEC. ± 3
7 TO 10 SEC.

MALLORY SUB INTERVAL SWITCH #7



KINGSTON SUB INTERVAL ACTION OF SWITCH #3 INDICATED BY

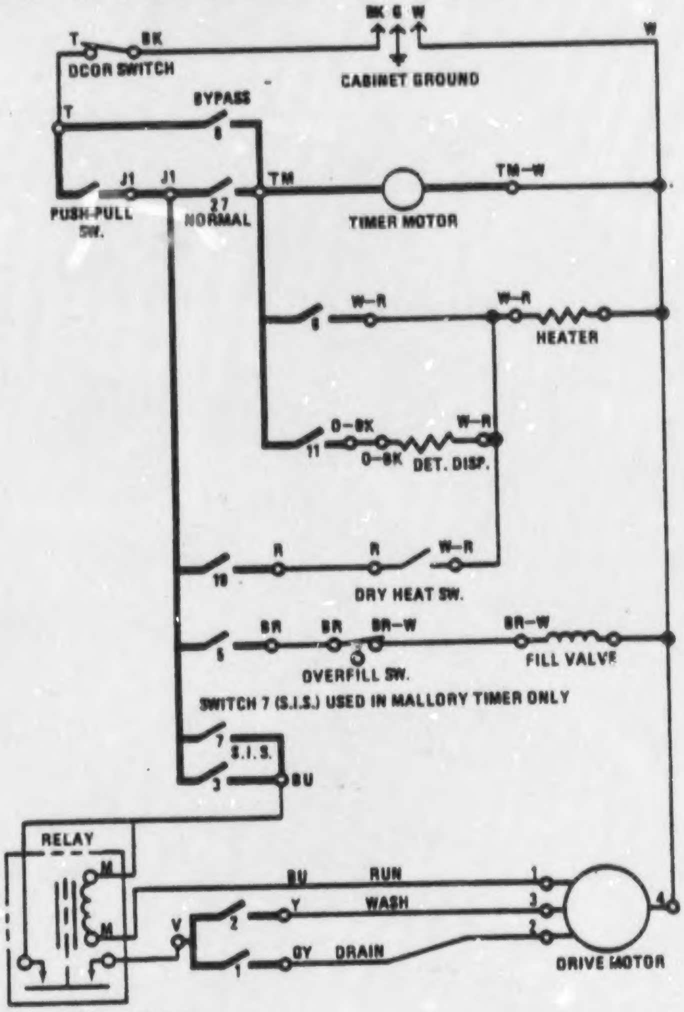

BK G W
W
T
BK
DOOR SWITCH
CABINET GROUND
BYPASS
T
8
J1
J1
TM
TM-W
PUSH-PULL SW.
27 NORMAL
TIMER MOTOR
W-R
W-R
6
HEATER
O-BK
W-R
11
O-BK
DET. DISP.
R
R
W-R
10
DRY HEAT SW.
BR
BR
BR-W
BR-W
5
OVERFILL SW.
FILL VALVE
SWITCH 7 (S.I.S.) USED IN MALLORY TIMER ONLY
7
S.I.S.
3
BU
RELAY
M
M
V
BU
RUN
Y
WASH
2
GY
DRAIN
1
1
3
2
4
DRIVE MOTOR

FIGURE 85. Wiring diagram.

Resource# 1 continued

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Do maintenance on a food disposer

TASK NO: 708

STUDENT WILL: Do maintenance on a food disposer to be sure it is operating properly

GIVEN: A food disposer, tools and equipment.

TOOLS & EQUIPMENT: screwdrivers, small socket wrench set, V.O.M. electrical meter and test leads, clamp-on amperage meter, and flashlight

TASK STEPS:

1. Check incoming electrical power at disposer using the V.O.M. meter. Be sure electrical start switch is operating correctly.
2. Check amperage of drive motor while it is running.
3. Compare amperage of drive motor with amount of amperage printed on motor nameplate.
4. Check for leaks around sink flange and drain connections. NOTE: First be sure drain is clean. See Information Sheet pg. 708-1 in this guide.
5. Shut off electrical power to disposer.
6. Remove stopper assembly and look into grinder chamber (part of disposer that cuts garbage into small pieces).
7. Check grinder chamber for large pieces of garbage that are still in chamber.
8. Inspect the other components of disposer. See "Looking inside a Disposer" and Trouble Diagnosis Chart" on Information Sheets 708-2 and 708-3 in this guide.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Automatic Dishwasher Food Disposer and Trash Masher-Whirlpool Corp., 1978

LEARNING ACTIVITIES

1. Look at pictures of food disposer and parts. See your textbook pg. 241. Also see the owner's manual for the food disposer.

2. Read all information listed in Task# 708. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat wht the teacher did. See Competency Sheet and follow instructions in "TASK STEPS".

5. Fill-out checklist to see if you have completed Task# 708 correctly. See student Evaluation Checklist in this guide.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student check incoming electrical power and start switch properly?		
2. Did student check drive motor amperage properly?		
3. Did student compare amperage of drive motor to amount printed on motor nameplate?		
4. Did student check sink flange and drain connections for leaks?		
5. Did student check grinder chamber properly?		
6. Did student use the Information Sheets indicated when inspecting the other components of disposer?		
7. Did student shut off power to disposer before removing stopper assembly?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 7
TOTAL POINTS POSSIBLE = 7

TASK# 708

INFORMATION SHEET 708-1

FLANGES & DRAIN CONNECTIONS

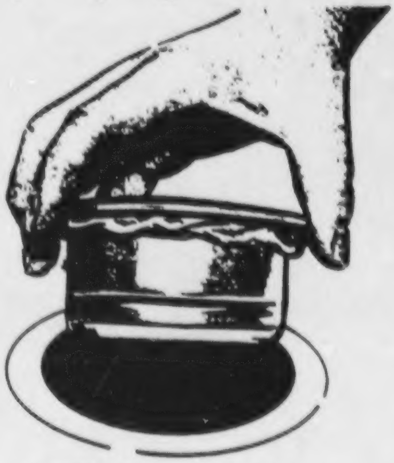


FIGURE 143. Sink flange.

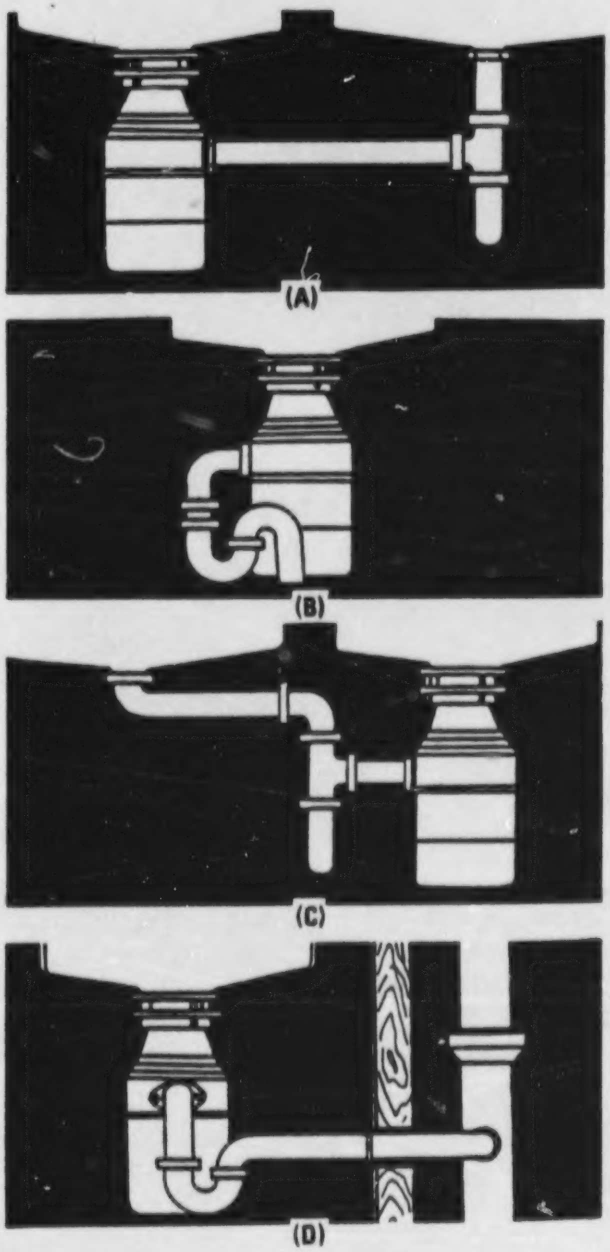


FIGURE 145. Typical drain connections.

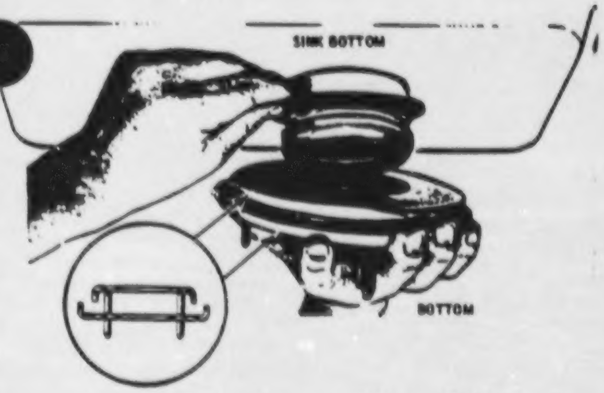


FIGURE 144. Mounting of lower flanges.

Resource# 1
Automatic Dishwasher Food Disposer and Trash Masher Whirlpool Corp.

pg. 92,94,103, and 104

Program	Task	Page
	708	1

INFORMATION SHEET 708-2

"LOOKING INSIDE A DISPOSER"

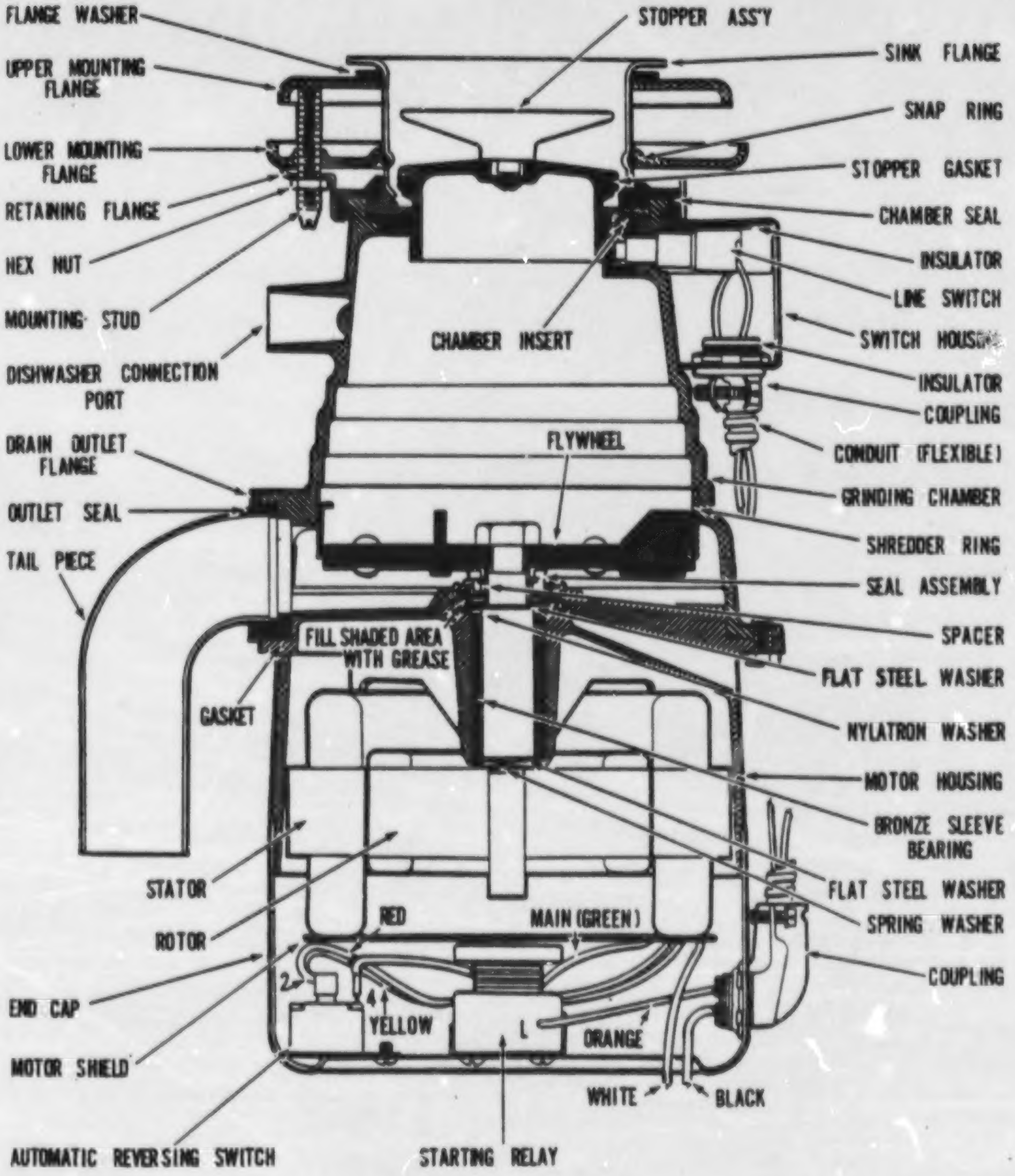

FLANGE WASHER
STOPPER ASS'Y
SINK FLANGE
UPPER MOUNTING FLANGE
SNAP RING
LOWER MOUNTING FLANGE
STOPPER GASKET
RETAINING FLANGE
CHAMBER SEAL
HEX NUT
INSULATOR
LINE SWITCH
MOUNTING STUD
CHAMBER INSERT
SWITCH HOUSING
DISHWASHER CONNECTION PORT
INSULATOR
COUPLING
DRAIN OUTLET FLANGE
FLYWHEEL
CONDUIT (FLEXIBLE)
GRINDING CHAMBER
OUTLET SEAL
SHREDDER RING
TAIL PIECE
SEAL ASSEMBLY
FILL SHADED AREA WITH GREASE
SPACER
FLAT STEEL WASHER
GASKET
NYLATRON WASHER
MOTOR HOUSING
BRONZE SLEEVE BEARING
STATOR
FLAT STEEL WASHER
ROTOR
SPRING WASHER
RED
MAIN (GREEN)
COUPLING
END CAP
2
4
YELLOW
L
ORANGE
MOTOR SHIELD
WHITE
BLACK
AUTOMATIC REVERSING SWITCH
STARTING RELAY

FIGURE 153. Cutaway with automatic reversing switch.

Resource# 1 continued

TROUBLE DIAGNOSIS CHART

PROBLEM	PROBABLE CAUSE	CORRECTION
A. Overload protector trips.	1. Unit is jammed.	1. Remove material causing jam, reset overload (on SLD50, SMD50 & SMD80 series. Allow time for automatic reset.)
	2. Motor stays in start winding.	2. Replace start relay.
	3. Low voltage.	3. Check voltage.
	4. Shorted or open windings.	4. Replace motor.
	5. Defective motor bearings.	5. Replace motor.
	6. Defective relay.	6. Replace relay.
B. Leaks around sink flange.	1. Loose mounting screws.	1. Tighten.
	2. Insufficient putty.	2. Re-putty.
C. Leaks at tail pipe gasket.	1. Loose flange.	1. Tighten.
	2. Improperly installed gasket.	2. Replace properly.
D. Leaks between body and chamber.	Defective or improperly placed gasket.	Replace.
E. Leaks between chamber and sink flange.	1. Loose mounting.	1. Tighten.
	2. Defective gasket.	2. Replace.
F. Abnormal noise or vibration.	1. Undisposable matter in chamber.	1. Clean out.
	2. Flange gasket or tail pipe gasket improperly placed.	2. Replace.
	3. Mounting screws loose.	3. Tighten screws.
G. Erratic operation.	1. Loose wiring, switch, motor power connection.	1. Locate and reconnect.
	2. Worn stopper.	2. Replace stopper.
H. Slow grinding.	1. Undisposable matter.	1. Remove.
	2. Damaged impeller.	2. Replace.
	3. Insufficient water flow.	3. Min. 1-1/2 gpm.
	4. Worn or broken tab on shredder ring.	4. Replace grinding chamber.
I. Slow flow.	1. Partially clogged drain (this would also show with water run off when not grinding).	1. This must be called to the user's attention.
	2. Clogged shredder teeth (usually due to insufficient water flow).	2. Remove material from chamber and clean shredder ring.

(Continued)

Resource# 1 continued

DISPOSERS

TROUBLE DIAGNOSIS CHART

PROBLEM	PROBABLE CAUSE	CORRECTION
J. Jammed.	Something stuck between impeller and shredder.	Physically move impeller with unjamming device until free.
K. Won't stop.	1. Defective switch.	1. Replace.
	2. Short in wiring.	2. Clear short & insulate.
	3. Incorrect wiring.	3. Reconnect properly.
L. Won't run.	1. Overload protector has tripped.	1. Wait for motor to cool off and reset manually (SLD50, SMD60 and SMD80 series will reset automatically.)
	2. Blown fuse in power supply.	2. Replace.
	3. Defective switch.	3. Replace.
	4. Burned out motor winding.	4. Replace motor.
	5. Open or shorted wiring.	5. Repair.
	6. Defective relay.	6. Replace relay.

Resource# 1 continued

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTNENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Do service maintenance on an automatic clothes washer

TASK NO: 709

STUDENT WILL: Do service maintenance on an automatic clothes washer to be sure it is operating properly.

GIVEN: An automatic clothes washer, tools and equipment.

TOOLS & EQUIPMENT: screwdrivers, small socket wrench set, box wrenches V.O.M. electrical meter and test leads, clamp-on amperage meter, bucket

TASK STEPS:

1. Check the hot and cold water supply hoses and connections as indicated. (see page 709-1 in this guide.)
2. Check the discharge and suds saver hoses and connections.
3. Check the electrical power for proper voltage, fuses and grounding.
4. Disconnect electrical cord from wall outlet,
5. Remove service panel of washer.
6. Check electrical connections at all electrical components of washer to be sure they are tight. (see page 709-2 in this guide.)
7. Check continuity of any wire or electrical component that is not attached firmly to its location.
8. Connect electrical cord to wall outlet.
9. Check amperage of drive motor while it is running.
10. Compare amperage of drive motor with the amount of amperage printed on motor plate.
11. Shut off hot and cold water supplies.
12. Remove and clean pump guard. Collect drain water in bucket. (see page 709-3 in this guide.
13. Remove cover on water pump and clean pump. Collect drain water in bucket.
14. Remove cover on filter and clean filter assembly. Collect water in bucket.
15. Clean screens at inlet water valve.
16. Look for oil leaks at the gear case assembly.
17. Inspect condition of other mechanical parts for wear (amount of use) and for loose bolts. (see owner's manual for washer).
    CAUTION: Disconnect electrical cord before servicing washer.

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTNENANCE PROGRAM
(CONTINUED)

TASK NO: 709

TASK STEPS:

18. Check agitatior shaft on bearings.
19. Trace (follow) the operations of the washer. (see wiring diagram and chart on page 709-4 in this guide).
20. Check the other components of washer to be sure they are operating properly. (see "Trouble-shooting" on pgs. 709-5 and 709-6 in this guide).

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Textbook-Complete Do-it-Yourself Manual
Owner's Manual for Automatic washer
Automatic Washers

LEARNING ACTIVITIES

1. Look at pictures and read information on Automatic Clothes Washer. See your textbook pg. 242. Also see pgs. 709-1 to 709-6 in this guide.

2. Read all information listed in Task# 709. See Competency Sheet in this guide.

3. Ask teacher to demonstrate this task. See teacher.

4. Repeat what the teacher did. See Competency Sheet and follow all instructions in "TASK STEPS."

5. Fill-out checklist to see if you have completed Task# 709 correctly. See student Evaluation Checklist in this guide.

6. Give teacher the completed Student Evaluation Checklist to check.

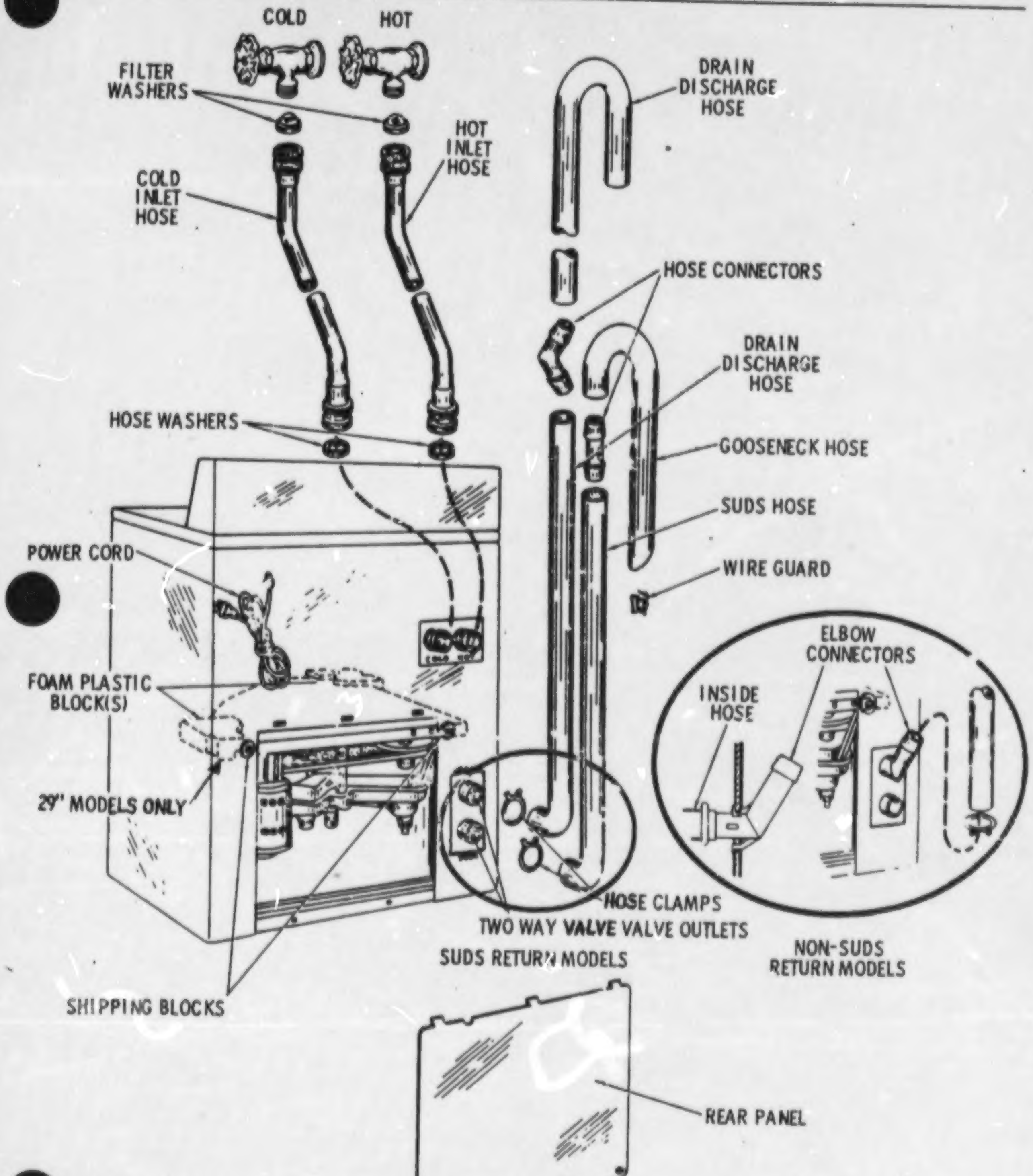
STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student check the hot and cold water supply hoses and connections properly?		
2. Did student check the discharge and suds saver hoses properly?		
3. Did student check electrical power for proper voltage, fuses and grounding?		
4. Did student pull out electric cord for wall outlet before taking off service panel?		
5. Did student check all electrical connections to see that they were tight?		
6. Did student check amperage of drive motor properly?		
7. Did student clean all components in water system as indicated?		
8. Did student check the operating condition of the mechanical components as indicated?		
9. Did student use "trouble-shooting" sheets in this guide properly?		
10. Did student connect electric cord to wall outlet when finished?		

TOTAL POINTS EARNED =

POINTS NEEDED FOR MASTERY = 10
TOTAL POINTS POSSIBLE = 10

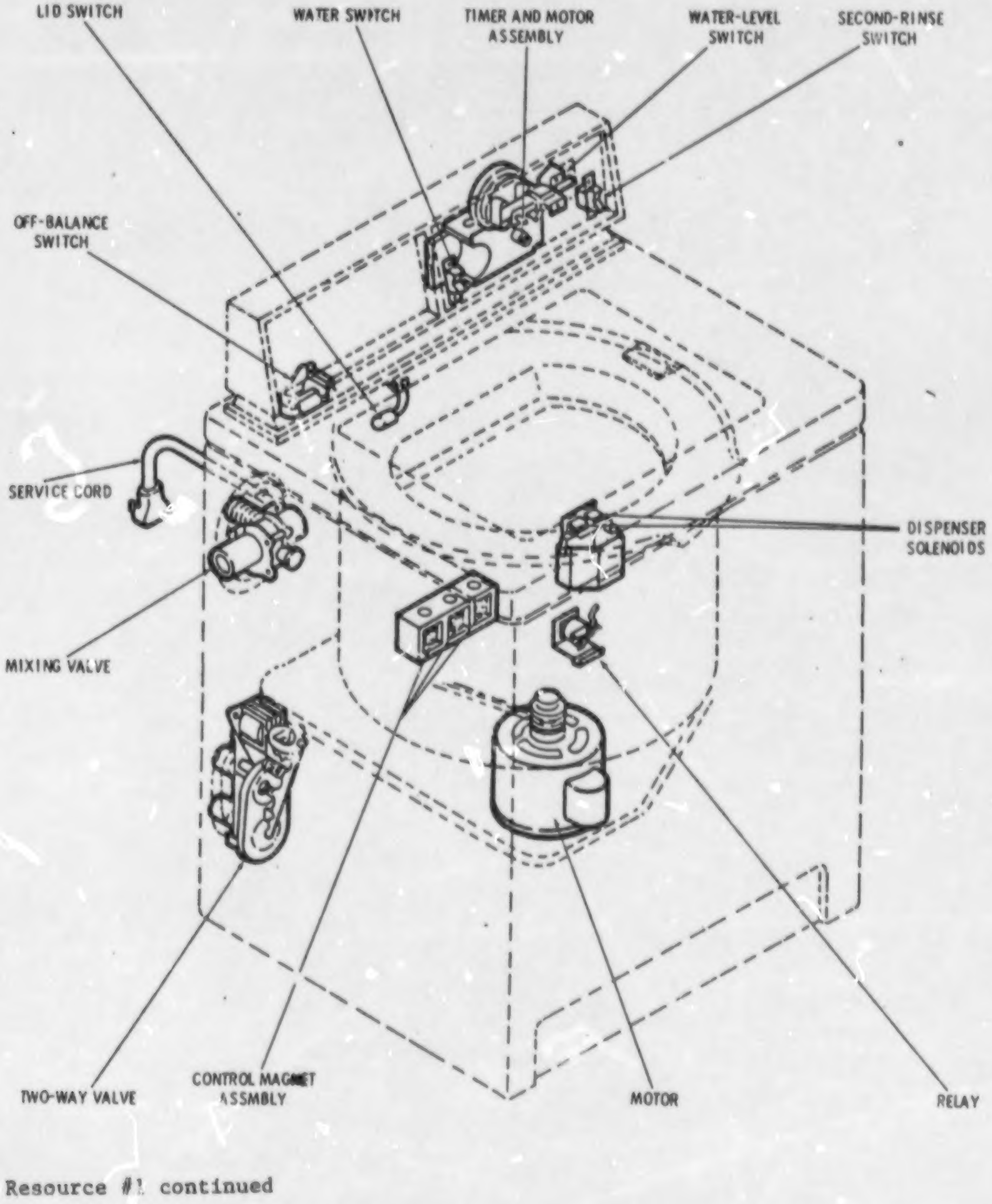
TASK# 709


COLD
HOT
FILTER WASHERS
DRAIN DISCHARGE HOSE
HOT INLET HOSE
COLD INLET HOSE
HOSE CONNECTORS
DRAIN DISCHARGE HOSE
HOSE WASHERS
GOOSENECK HOSE
SUDS HOSE
POWER CORD
WIRE GUARD
ELBOW CONNECTORS
INSIDE HOSE
FOAM PLASTIC BLOCK(S)
29" MODELS ONLY
HOSE CLAMPS
TWO WAY VALVE VALVE OUTLETS
SUDS RETURN MODELS
NON-SUDS RETURN MODELS
SHIPPING BLOCKS
REAR PANEL

Resource# 1

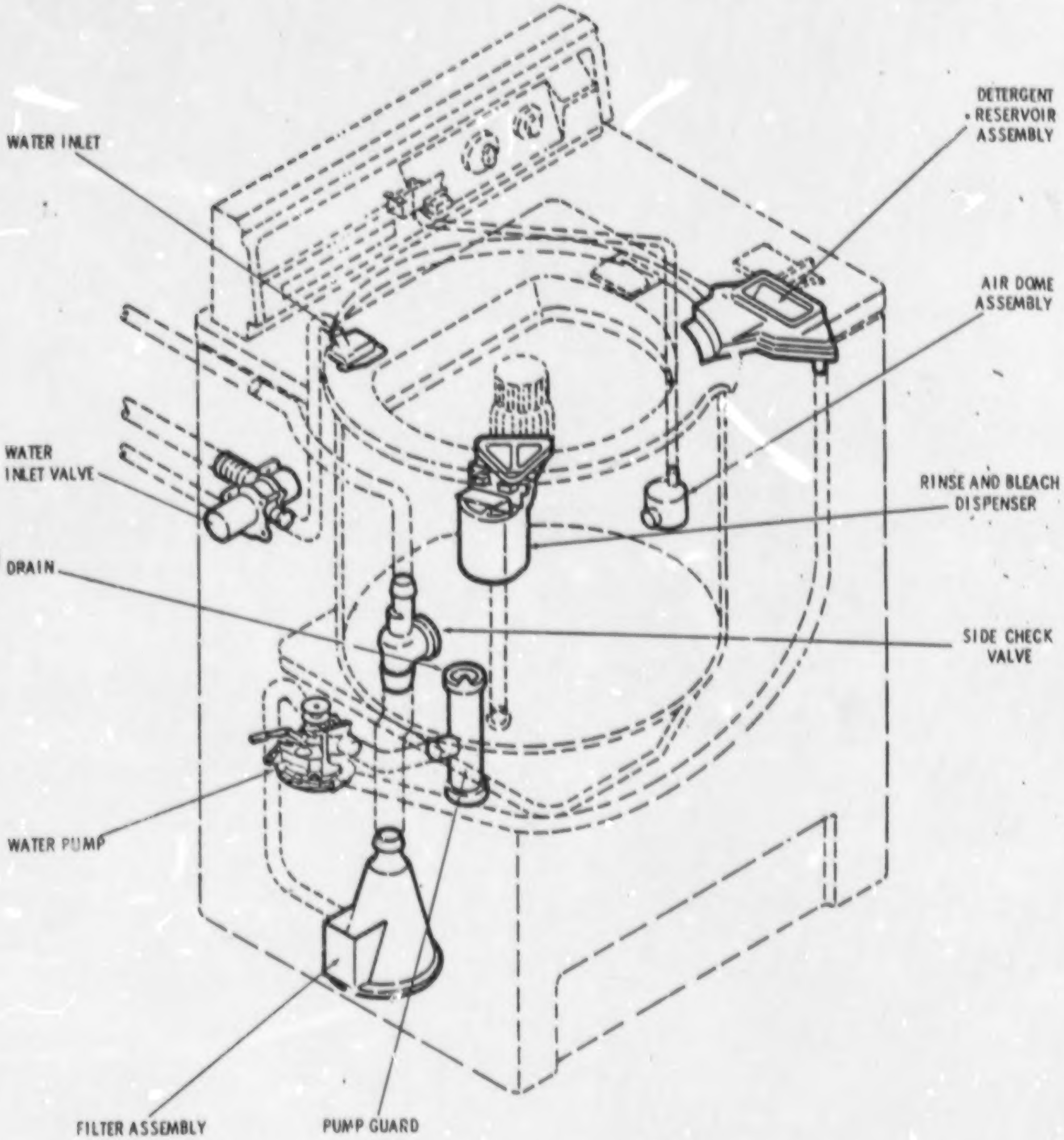
Automatic Washers-Whirlpool Corp.
Pages 55, 63, 88, 134 139-140

ELECTRICAL COMPONENTS


LID SWITCH
WATER SWITCH
TIMER AND MOTOR ASSEMBLY
WATER-LEVEL SWITCH
SECOND-RINSE SWITCH
OFF-BALANCE SWITCH
SERVICE CORD
DISPENSER SOLENOIDS
MIXING VALVE
TWO-WAY VALVE
CONTROL MAGNET ASSMBLY
MOTOR
RELAY

Resource #1 continued

WATER SYSTEM


DETERGENT RESERVOIR ASSEMBLY
WATER INLET
AIR DOME ASSEMBLY
WATER INLET VALVE
RINSE AND BLEACH DISPENSER
DRAIN
SIDE CHECK VALVE
WATER PUMP
FILTER ASSEMBLY
PUMP GUARD

Resource# 1 continued

WARNING-DISCONNECT FROM ELECTRICAL SUPPLY BEFORE SERVICING UNIT

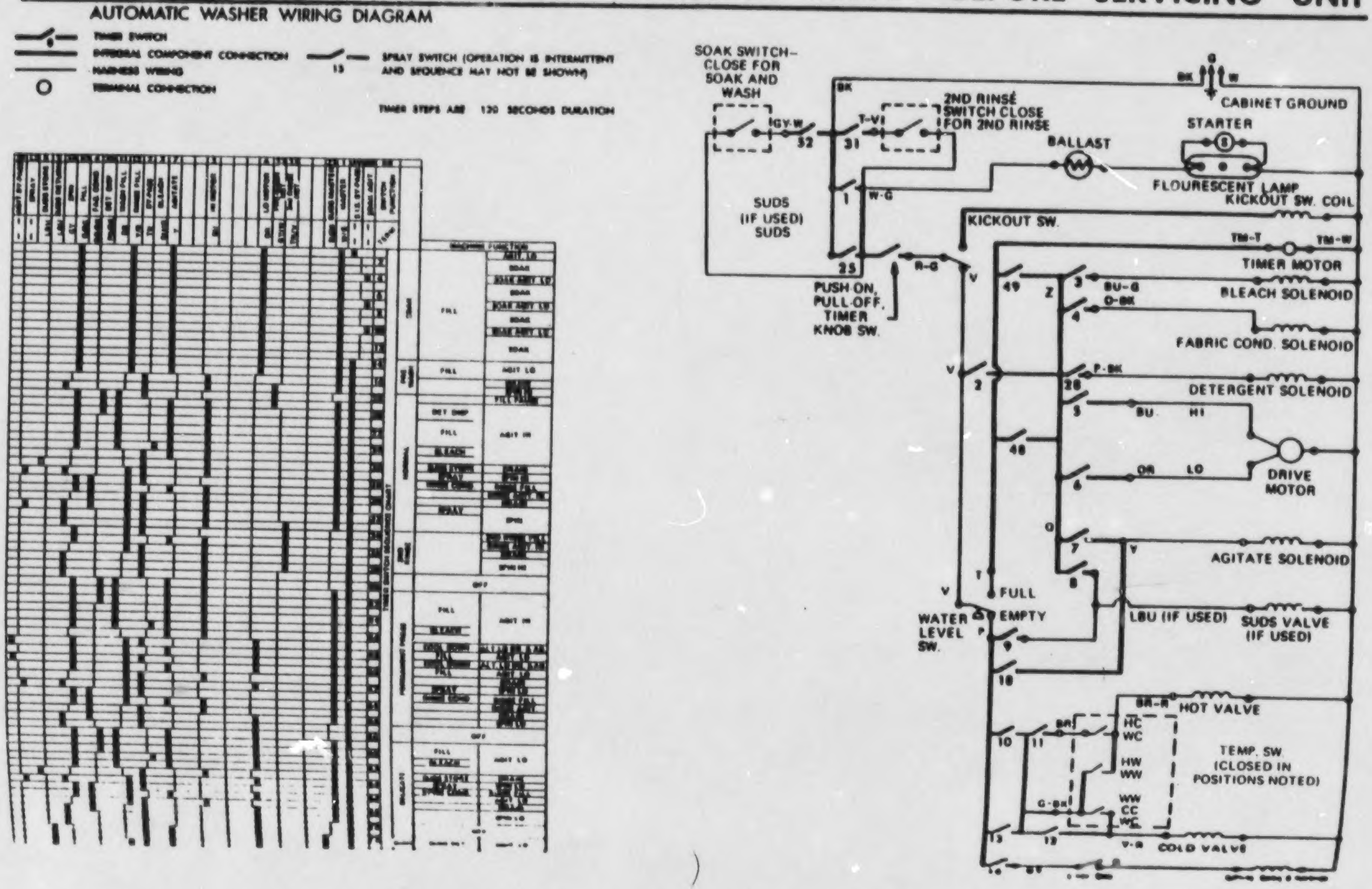

AUTOMATIC WASHER WIRING DIAGRAM
TIMER SWITCH
INTEGRAL COMPONENT CONNECTION
HARNESS WIRING
TERMINAL CONNECTION
SPRAY SWITCH (OPERATION IS INTERMITTENT AND SEQUENCE MAY NOT BE SHOWN)
TIMER STEPS ARE 120 SECONDS DURATION
SOAK SWITCH–CLOSE FOR SOAK AND WASH
GY-W
32
31
T-VI
2ND RINSE SWITCH CLOSE FOR 2ND RINSE
BK
CABINET GROUND
STARTER
BALLAST
FLOURESCENT LAMP
KICKOUT SW. COIL
SUDS (IF USED) SUDS
W-G
KICKOUT SW.
TM-T
TM-W
TIMER MOTOR
R-G
25
PUSH ON, PULL-OFF, TIMER KNOB SW.
49
BU-G
O-BK
BLEACH SOLENOID
FABRIC COND. SOLENOID
P-BK
DETERGENT SOLENOID
BU
HI
OR
LO
DRIVE MOTOR
AGITATE SOLENOID
FULL
EMPTY
WATER LEVEL SW.
LBU (IF USED)
SUDS VALVE (IF USED)
BR-R
HOT VALVE
HC
WC
HW
WW
CC
G-BK
TEMP. SW. (CLOSED IN POSITIONS NOTED)
V-R
COLD VALVE

Fig. 8-7. Typical automatic washer label.

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Troubleshooting

Chart 9-1. Trouble Diagnosis Chart

Problem	Possible Cause	Action
Water Will Not Enter Machine	Water supply valves closed	Open valve
	Faulty water temperature switch	Check; if faulty, replace
	Open circuit in timer	Check; if faulty, replace
	Open circuit in wiring harness	Check; if faulty, repair
	Loose lead on valve solenoid	Secure terminal
	Open inlet valve solenoid	Check; if faulty, replace
	Clogged inlet strainer screen	Remove screens; flush sediment from screens
	Defective water level switch	Check; if faulty, replace
	Supply hose kinked	Replace hose to prevent kinking
	Defective off-balance switch	Check; if faulty, replace
Motor will not run	Branch circuit fuse blown or motor thermal overload tripped	Replace fuse; allow motor thermal overload to cool
	No power to washer	Check cord to wall receptacle
	Faulty timer	Check; if faulty, replace
	Loose lead on timer	Secure terminal
	Inoperative motor	Check; if faulty, replace
	Open circuit in washer wiring	Check; if faulty, repair
	Terminal receptacle disconnected	Secure terminal receptacle
	Faulty water level control switch	Check; if faulty, replace
	Defective off-balance switch	Check; if faulty, replace
Machine Will Not Agitate	Loose lead connection (timer-motor-solenoid)	Secure terminals
	Faulty gear case	Repair
	Inoperative motor	Check; if faulty, replace
	Inoperative agitator solenoid	Check; if faulty, replace
	Loose pulleys (main drive and motor)	Tighten pulleys
	Broken cam bar rivet	Install new rivet
	Faulty water level control switch	Check; if faulty, replace
	Loose or broken belt	Adjust or replace
	Defective off-balance switch	Check; if defective replace

Resource# 1 continued

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Chart 9-1. (Cont.)

Problem	Possible Cause	Action
Water Does Not Drain From Machine	Clogged drain connection	Remove obstruction
	Clogged or frozen pump	Remove obstruction or replace
	Loose impeller in pump	Adjust or replace
	Agitator solenoid stuck	Check; if faulty, repair
	Drain hose kinked	Relocate hose to prevent kinking
	Pump flapper	Check; if faulty, replace
	Loose motor belt	Adjust motor bracket to tighten belt
	Air lock	Check hole in manifold baffle and flapper valve seating in pump
	Suds lock	Add cold water to washer, remove suds
	Plugged filter	Replace
Basket Will Not Spin	Loose belt	Adjust motor bracket to tighten belt
	Broken belt	Replace
	Loose motor pulley	Tighten pulley set screw
	Loose set screw in upper brake hub	Tighten set screw
	Grease or oil on clutch lining	Check for source; repair, clean lining and adjust
	Broken wire or loose connection	Check; if faulty, repair
	Broken clutch brake spring	Check; if faulty, replace
	Faulty lid switch (if used)	Check; if faulty, replace
	Defective spin solenoid	Check; if faulty, replace
	Basket clutch shaft frozen	Check; if faulty, repair
	Broken cam bar rivet	Install new rivet
	Faulty water level switch	Check; if faulty, replace
	Gearcase misaligned	Realign
	Faulty timer	Check; if faulty, replace
Machine Will Not Spray Rinse	Water supply valves closed	Open valve
	Faulty mixing valve and solenoid	Check; if faulty, replace
	Kinked supply hoses	Relocate hose to prevent kinking
	Plugged screens	Check; if faulty, replace
	Faulty water level control switch	Check; if faulty, replace
	Faulty water temperature switch (if used)	Check; if faulty, replace
	Defective off balance switch	Check; if faulty, replace
	Defective timer	Check; if faulty, replace
	Break in wiring harness	Repair harness
Suds Water Will Not Return to Machine	Faulty two-way valve	Check; if faulty, repair
	Flapper in pump not operating	Repair
	Loose or worn belt	Adjust or replace
	Kinked or plugged hose	Relocate or clean hose
	Defective water level switch	Check; if faulty, replace
	Faulty timer	Check; if faulty, replace
	Loose connection or break in wiring harness	Repair connector or break in harness
	Defective agitation solenoid	Check; if faulty, replace
Excessive Vibration or Machine Walks	Washer not level	Level machine side to side and front to rear
	Leveling leg locknuts not tight	Secure lockout against frame of washer after leveling
	Weak flooring	Normal solidity of floor necessary
	Oil or grease on snubber	Clean snubber or replace if worn
	Broken cabinet gusset	Check; if faulty, repair
	Unbalanced load	Redistribute load
	Damaged suspension rods and bulbs	Increase pressure on rod balls by adding material under cap
	Gearcase braces loose or removed	Install braces or tighten loose braces
	Shipping blocks not removed	Remove shipping blocks
Machine Damages Clothing	Broken agitator	Replace agitator
	Defective basket	Repair or replace
	Use of excessive bleach	Instruct customer
	Overloading the machine	Instruct customer
	Spins during agitation	Adjust clutch
	Water level too low	Increase water level
Water Will Not Shut Off	Faulty water inlet valve	Check; if faulty, replace
	Plugged or leaky pressure switch control hose	Correct
	Defective water level control switch	Check; if faulty, replace
Machine Leaks Water	Inlet hose not secured to inlet valve	Check hose clamps
	Drain connection or drain hose not secured to pump	Check hose clamps
	Pump gasket not in place	Replace gasket
	Leak in tub	Repair or replace
	Defective hose	Replace hose
Machine Leaks Oil	Leak in transmission	If leak at drive gear or pinion shaft, install "O" ring or oil-seal kit. Repair

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Related Skills

JOB TASK: Do service maintenance on clothes dryer

TASK NO: 710

STUDENT WILL: Do service maintenance on gas and electric clothes dryer to be sure they are operating properly

GIVEN: Clothes dryers tools and equipment.

TOOLS & EQUIPMENT: screwdrivers, small socket wrench set, V.O.M. electrical meter, clamp-on amperage meter, hose type vacuum cleaner, gas leak detector solution

TASK STEPS:

DRYER INSTALLATION

1. Check electrical power at clothes dryer.
2. Check gas pipe lines for leaks.
3. Check exhaust ducts. (see picture #1 on Information Sheet 710-1 in this guide).
4. Remove access (service) panels and turn off electrical power.
5. Check drum seals. (see picture# 1 on Information Sheet 710-2 in this guide.
6. Check drum drive mechanism.
7. Check drive belt. (see picture# 2 on Information Sheet 710-2 in this guide.
8. Test resistance of motor.
9. Test amperage of motor while motor is running.

AIR CIRCULATION

10. Check and clean exhaust fan. (see picture# 2 on Information Sheet 710-1 in this guide).
11. Check and clean lint screen.
12. Adjust tension (pulling pressure) on fan belt.

ELECTRIC DRYER HEAT

13. Turn electric power off and check heater elements.
14. Check terminals at heater assembly. (see Information Sheet 710-3 in this guide).

(CONTINUED ON NEXT PAGE)

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM
(CONTINUED)

TASK NO: 710

TASK STEPS:

GAS DRYER HEAT

15. Check burner ignition (see picture# 1 on Information Sheet 710-4 in this guide).
16. Check pilot flame.
17. Check glow-coil ignitor. (see picture# 2 on Information Sheet 710-10 in this guide).
18. Check Glow-Sil ignitor. (see picture# 3 on Information Sheet 710-4 in this guide).
19. Check gas pressure regulators for leaks. (see picture# 1 on Information Sheet 710-5 in this guide.
20. Check gas valve for leaks. (see picture# 2 on Information Sheet 710-5 in this guide.
21. Check connection at thermostats.
22. Check "push to start" switch using V.O.M. meter (see picture# 1 on Information Sheet 710-6 in this guide).
23. Check door switch using V.O.M. meter.
24. Check all connections at the timer. (see wiring diagram picture# 2 on Information Sheet 710-6 in this guide).
25. Find and repair any other problem with dryer using "Trouble-Shooting" pg. 710-7 to 710-9 in this guide, and "Basic Dryer Wiring Diagram on Information Sheet 710-6 in this guide.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Dryers automatic gas/electric Whirlpool Corp, 1982.

LEARNING ACTIVITIES

1. Read all information listed in Task# 710. See Competency Sheet in this guide.
   NOTE: Be sure to look at all the sheets presented in this guide. See them in the order indicated on Competency Sheet.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

4. Fill-out checklist to see if you have completed Task# 710 correctly. See Student Evaluation Checklist in this guide.

5. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student check dryer installation properly?		
2. Did student turn off electric power after removing access panel?		
3. Did student check dryer assembly parts?		
4. Did student test resistance and amperage of drive motor?		
5. Did student check and clean exhaust fan and lint screen?		
6. Did student adjust tension on fan belt?		
7. Did student check electric dryer heat elements properly?		
8. Did student check gas dryer heat components properly?		
9. Did student check electic controls properly?		
10. Did student use the Trouble-Shooting chart and wiring diagram in this guide to find any other problems?		
11. Does dryer operate properly?		

TOTAL POINTS EARNED =

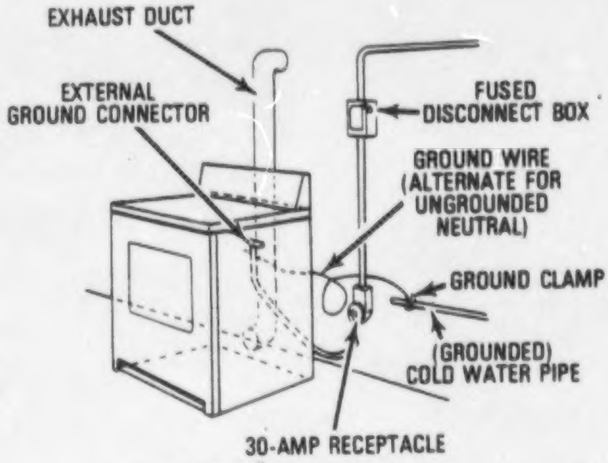
POINTS NEEDED FOR MASTERY = 11
TOTAL POINTS POSSIBLE = 11

TASK 710

INFORMATION SHEET 710-1

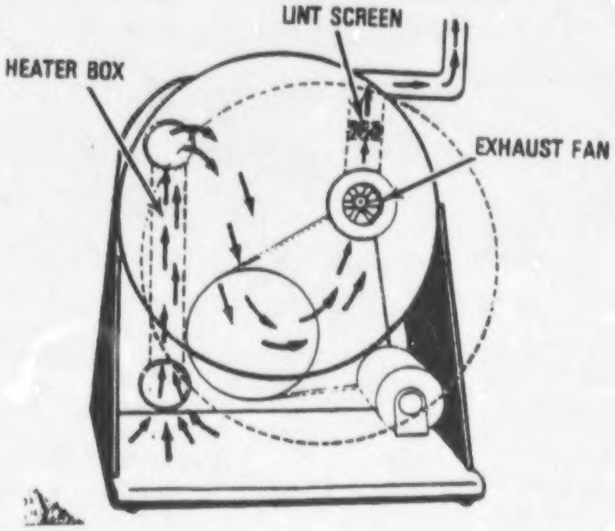
Typical Installation

The following illustration shows a typical installation of a standard or large capacity dryer. In this installation the fused disconnect box is located near the dryer, and the external ground connector is attached to a grounded cold water pipe. *See Figure 1-18.*


EXHAUST DUCT
EXTERNAL GROUND CONNECTOR
FUSED DISCONNECT BOX
GROUND WIRE (ALTERNATE FOR UNGROUNDED NEUTRAL)
GROUND CLAMP
(GROUNDED) COLD WATER PIPE
30-AMP RECEPTACLE

PICTURE #1

AIR-CIRCULATION SYSTEM

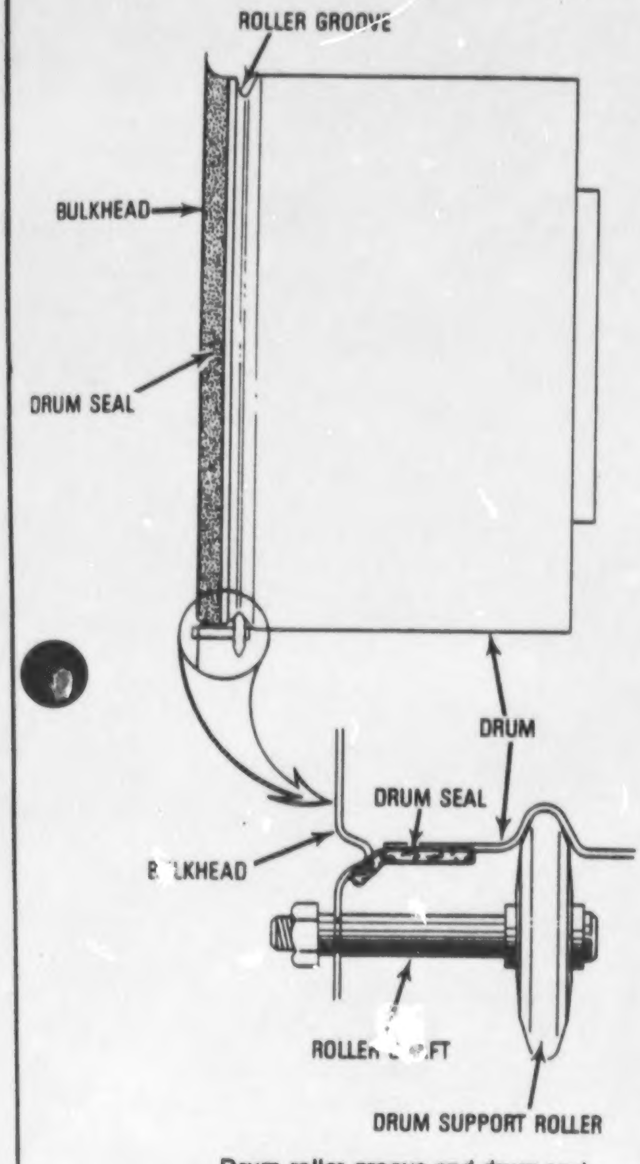

LINT SCREEN
HEATER BOX
EXHAUST FAN

PICTURE #2

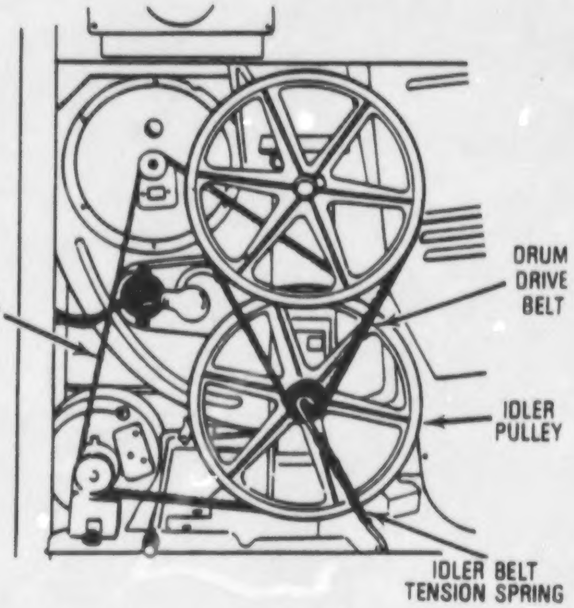
Resource# 1
Dryers-automatic gas/electric Whirlpool Corp., 1892 pg. 13,32,35,40,60,67, 70, 76,98, 103

INFORMATION SHEET 710-2

dryer assembly


ROLLER GROOVE
BULKHEAD
DRUM SEAL
DRUM
DRUM SEAL
BULKHEAD
ROLLER SHAFT
DRUM SUPPORT ROLLER

Drum roller groove and drum seal.


DRUM DRIVE BELT
FAN BELT
IDLER PULLEY
IDLER BELT TENSION SPRING

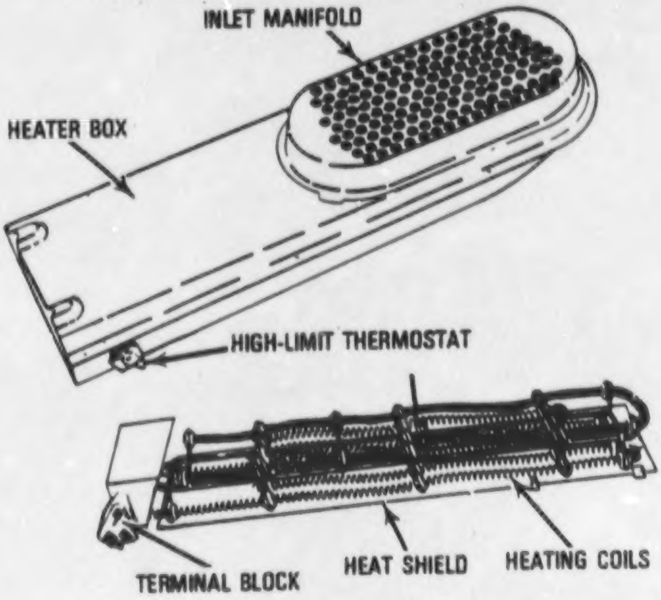
PICTURE #2

PICTURE #1

Resource# 1 continued

HEATER ASSEMBLY

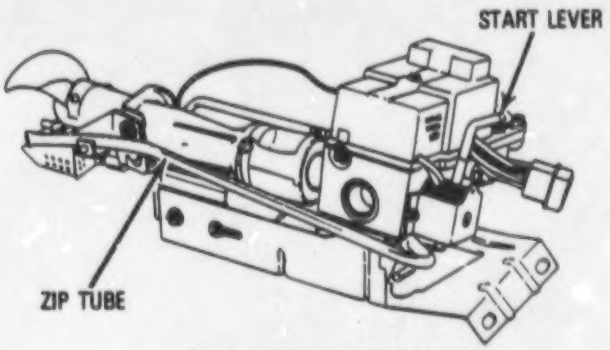
The element slides up into the heater box with an inteference fit for quiet operation. It is held in place by one screw. When replacing the element, be sure the heat shield and inlet manifold are in place.


INLET MANIFOLD
HEATER BOX
HIGH-LIMIT THERMOSTAT
TERMINAL BLOCK
HEAT SHIELD
HEATING COILS

Heater assembly.

Resource# 1 continued

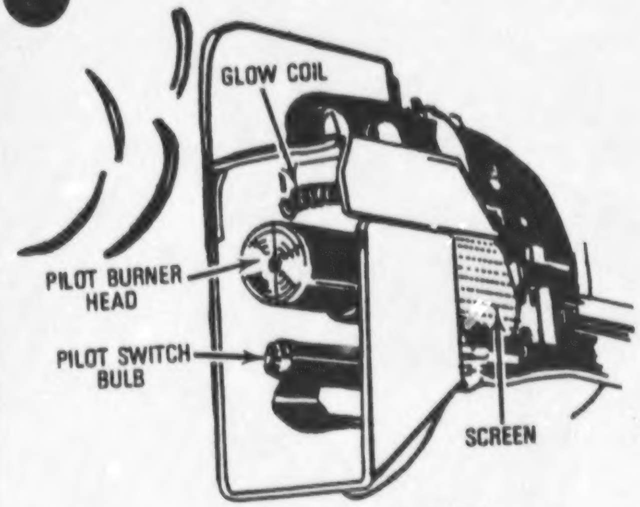
Gas Drying Heat


START LEVER
ZIP TUBE

Match-light ignition burner.

PICTURE #1

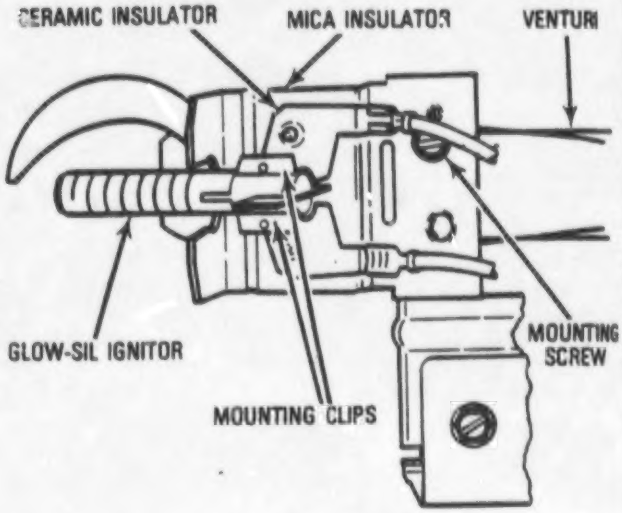
GLOW-COIL


GLOW COIL
PILOT BURNER HEAD
PILOT SWITCH BULB
SCREEN

Glow-coil pilot.

PICTURE # 2

GLOW-SIL


CERAMIC INSULATOR
MICA INSULATOR
VENTURI
GLOW-SIL IGNITOR
MOUNTING CLIPS
MOUNTING SCREW

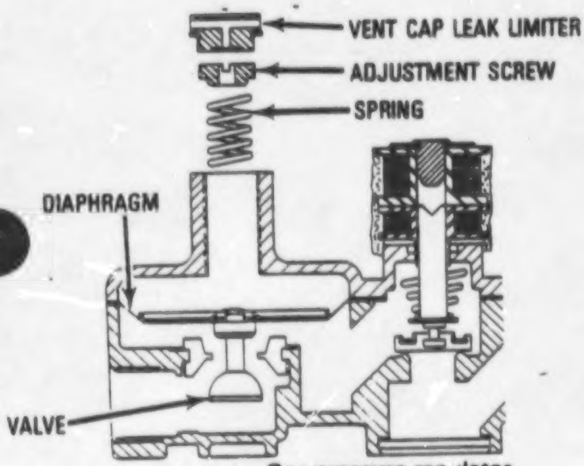
Glow-sil ignition burner.

PICTURE #3

Resource# 1 continued

INFORMATION SHEET 710-5

GAS PRESSURE REGULATOR

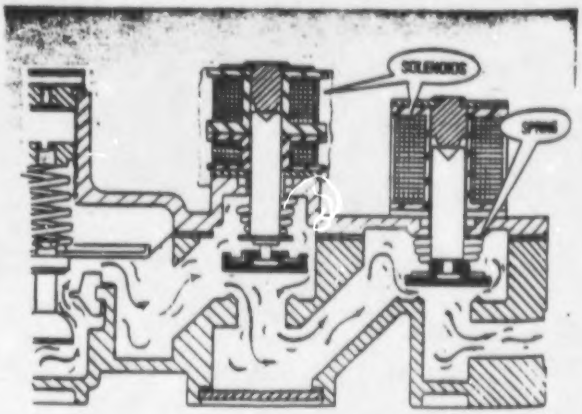

VENT CAP LEAK LIMITER
ADJUSTMENT SCREW
SPRING
DIAPHRAGM
VALVE

Gas pressure regulator.

PICTURE #1

GAS FLOW THROUGH VALVES

1. Each burner assembly always has two (2 valves.
2. Both valves are spring loaded closed and th solenoids must be energized to open them.
3. Both valves must be open for the burner to work. *See Figure 6-29.*

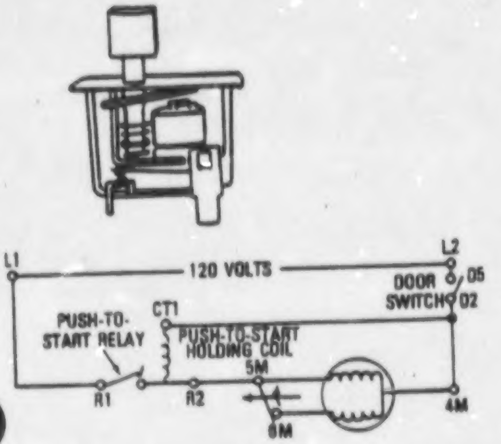

SOLENOIDS
SPRING

Gas flow through valves.

PICTURE #2

Resource# 1 continued

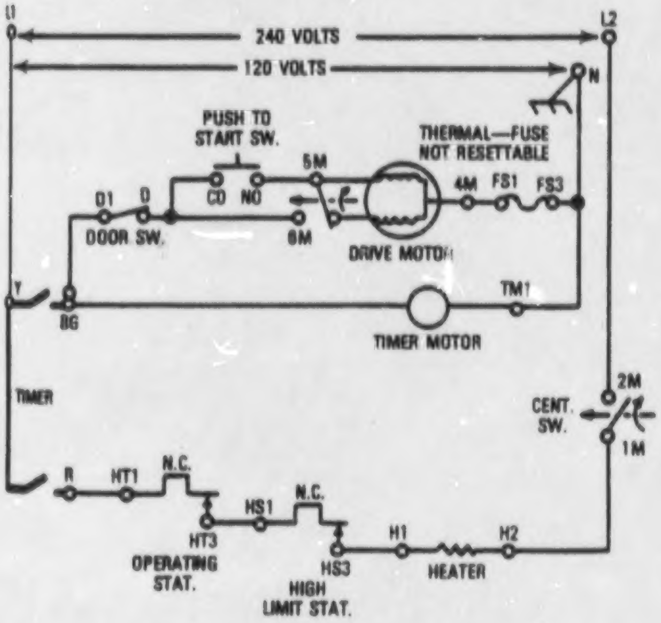
PUSH TO START RELAY AND COIL


L1
120 VOLTS
L2
DOOR SWITCH
D5
D2
CT1
PUSH-TO-START RELAY
PUSH-TO-START HOLDING COIL
5M
R1
R2
6M
4M

Push-to-start relay and coil.

PICTURE #1

BASIC DRYER WIRING DIAGRAM


L1
240 VOLTS
L2
120 VOLTS
N
PUSH TO START SW.
THERMAL—FUSE NOT RESETTABLE
5M
D1
D
CO
NO
4M
FS1
FS3
DOOR SW.
6M
DRIVE MOTOR
Y
BG
TM1
TIMER MOTOR
TIMER
2M
CENT. SW.
1M
R
HT1
N.C.
HT3
OPERATING STAT.
HS1
N.C.
HS3
HIGH LIMIT STAT.
H1
H2
HEATER

TIMER SCHEDULE IN MINUTES				
SWITCH CLOSED	CYCLE			
	NORMAL	OFF	AIR	OFF
Y-BG	100		35	
Y-R	← 6 →			

. Basic dryer wiring diagram.

PICTURE# 2

Resource# 1 continued

INFORMATION SHEET 710-7

Troubleshooting

PROBLEM	POSSIBLE CAUSE	ACTION
1. Will not run.	1.a.Power Supply	a.Check line fuses and line switches.
	b.Main Wiring Harness	b.Check for loose or broken terminal.
	c.Door Switch	c.Make continuity check on switch contacts.
	d.Main Motor	d.Check motor.
	e.Timer	e.Make continuity check on time contacts Y to BG.
	f.Push to Start Switch	f.Check start switch for continuity.
	g.Power Relay	g.Check power relay for open coil or bad contacts.
	h.Electronic Control	h.Be sure problem is electronic control before replacing.
2. Clothes not drying.	2.a.Operating thermostat	a.Check for open switch contacts.
	b.Main Motor	b.Check centrifugal switch M1 to M2 or M2 to M3 for open contacts. Motor must be running for this check.
	c.Timer	c.Check timer switch contacts Y to R for continuity. Also Y to BR if used on timer.
	d.Main Wiring Harness	d.Check for voltage at element or burner. Check harness for short or broken wire.
	e.Drum Belt	e.Check Belt. May be worn, broken, or off pulley. Faulty idler assembly.
	f.Drum Seals	f.Check front and rear drum seals. Must be properly positioned on the drum and flange surface.
	g.Exhaust Fan	g.Check fan for proper R.P.M., lint.
	h.Gas Burner	h.Check for function. (See Burner Section).
	i.Lint Screen	i.Check lint screen for lint.
	j.Air-heat Switch	j.Be sure switch is set on "Heat." Check for open switch contacts.
	k.Exhaust Duct	k.Check exhaust duct for lint blockage.
	l.Power Supply	l.Check line fuses and switches.
	m.Load	m.Check for size and type of load.
	n.Heat Element	n.Check for broken element wire.
	o.Open Sensor	o.Refer to Electronic Section of this Manual.
	p.Electronic Control	p.Replace only if all other components relative to this problem check good.
	q.Improperly Grounded Control Panel	q.Check for control panel being grounded. Check to be sure control panel is grounded to cabinet.
3. Drum will not rotate.	3.a.Drum Belt	a.Check for broken belt. Be sure it is properly positioned on motor pulley.

Resource# 1 continued

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INFORMATION SHEET 710-8

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	ACTION
4. Will not shut off.	4.a.Timer	a.Check timer motor for function and timer for welded contacts.
	b.Power Relay	b.Replace power relay.
	c.Operating Thermostat	c.Check for correct thermostat in dryer. Check for defective thermostat.
	d.Shorted Sensor	d.Check by removing wire AH2 from air heat switch and operate dryer on dampest setting.
	e.Electronic Control	e.Replace only if all other components relative to this problem check good.
	f.Air-heat Switch	f.Remove AH1, AH2 and AH4 leads from air heat Switch and connect together. If machine now functions properly replace air heat Switch.
5. Blowing fuses.	5.a.Electrical Ground	a.Check motor, electrical components and harness for ground.
	b.Fuse Box	b.Defective fuse box assembly. Improperly fused.
6. Moisture retention unsatisfactory.	6.a.Block Exhaust	a.Inspect exhaust system for lint.
	b.Open Sensor Circuit	b.Refer to electronic section of manual.
	c.Electronic Control	c.Replace only if all other components relative to this problem check good.
	d.Timer	d.Wrong timer selection.
	e.Thermostats	e.Check reason for improper cycling.
	f.Improperly grounded Control Panel	f.Check grounding of control panel.
7. Will not heat.	7.a.Main wiring harness	a.Check main harness at burner terminals for voltage.
	b.Operating and Safety Stats	b.Install jumper across terminals and test dryer or make continuity test on switch contact.
	c.Main Motor	c.Check motor centrifugal switch M1 to M2 or M2 to M3 for continuity. Motor must be operating for this test.
	d.Timer	d.Check continuity of timer contacts Y to R. Also Y to BR if used on timer.
	e.Power Relay	e.Check operation of power relay and replace if defective.
	f.Air-heat Switch	f.Set switch on heat. Test switch contact for continuity.
	g.Gas Burner	g.Check for function.
	h.Power Supply	h.Check line fuses and switches.
	i.Heat Element	i.Check for broken element wire.
8. Drying temperature too high.	8.a.Operating Thermostat	a.Check for lint that may insulate thermo bulb from exhaust air. Check thermostat for function.
9. Motor runs with door open.	9.a.Door Switch	a.Check door switch for function and switch clip actuating arm for proper switch plunger actuation.
10. bulb does not light.	10.a.Bulb burner out	a.Replace bulb.
	b.Door switch	b.Check door switch for continuity and function.
	c.Main Wiring Harness.	c.Check for loose terminals.

Resource# 1 continued

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INFORMATION SHEET 710-9

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	ACTION
11. Noise	11.a.Loose Components.	a.Secure component.
	b.Idler Assembly.	b.Check alignment and bearing assembly.
	c.Belt	c.Replace belt.
	d.Motor	d.Check motor.
	e.Lint	e.Remove lint from rear drum groove.
	f.Front Drum Bearings	f.Lubricate or replace bearings or delrin ring.
	g.Support roller Assemblies	g.Replace roller and/or shaft.
	h.Baffle	h.Tighten assembled baffle.
	i.Blower	i.Foreign matter in blower housing.
	j.Buzzing Power Relay	j.Replace power relay.
12. Radio Interference (AM band only)	12.Electronic Dryer control causing radio frequency interference on weak stations.	a.Correct by installing a 0.1 microfarad 500 volt non-electroytic capacitor from a point common to PR1 of the power resistor to neutral (N). In present wrinkle guard machines this is done easily by connecting the capacitor from timer terminal RJ to timer terminal TM1, and in machines without wrinkle guard, from timer terminal BG to timer terminal TM1. This capacitor is a common part and can probably be found in your television repair shop.
13. Clothes "Balling" Complaints	13.Large garments (sheets-spreads) "balling" instead of tumbling.	a.Check to see if dryer is being overloaded b.On 29" dryer check drum speed (48 ±3 rpm). If drum speed is proper, replace removable baffle with part No. 342847 which is a baffle 3/4" higher than standard baffle. This provides better lifting and tumbling of large items.

Resource# 1 continued

COMPETENCY SHEET
PROJECT VOICE
BUILDING MAINTENANCE PROGRAM

DUTY TITLE: Supportive Skills

JOB TASK: Operate lawn (yard) equipment

TASK NO: 711

STUDENT WILL: Operate several pieces of lawn maintenance equipment.

GIVEN: A lawn that needs maintenance, tools and supplies.

TOOLS & EQUIPMENT: shrub trimmer, lawn mower, grass edges, roto-tiller, weed cutter, grass seed, lawn fertilizer

TASK STEPS:

1. Cut grass using a rotary, then a reel-type lawn mower.
2. Cut grass along edges using a lawn edger.
3. Cut all tall grass and weeds using a weed cutter.
4. Remove dead grass using rake.
5. Put new grass seed over bare areas of lawn.
6. Fill spreader with lawn fertilizer and fertilize grass.
7. Loosen an area of hard dirt using the roto-tiller.
8. Trim bushes using a shrub trimmer. (bush cutter).
9. Throw away the cut pieces of bushes in a proper location.

EVALUATION: Student Evaluation Checklist. Must score satisfactorily on each item.

RESOURCES: Fix-it-Yourself Manual-Reader's Digest Ed., 1977 pgs. 392-424

LEARNING ACTIVITIES

1. Read all information listed in Task# 711. See Competency Sheet in this guide.

2. Ask teacher to demonstrate this task. See teacher.

3. Repeat what the teacher did. See Competency Sheet and follow instructions in "TASK STEPS."

4. Fill-out checklist to see if you have completed Task# 711 correctly. See student Evaluation Checklist in this guide.

5. Give teacher the completed Student Evaluation Checklist to check.

STUDENT EVALUATION CHECKLIST

ITEMS TO BE CHECKED	RATING	
	YES	NO
1. Did student operate all lawn equipment properly?		
2. Did student put new grass seed over bare areas of lawn?		
3. Did student remove dead grass from lawn as indicated?		
4. Did student trim shrubs as indicated?		
5. Did student throw away the cut pieces of bushes in a proper location?		
6. Did student remove all tall grass and weeds as indicated?		

TOTAL POINTS EARNED = 6

POINTS NEEDED FOR MASTERY = 6
TOTAL POINTS POSSIBLE = 6

TASK# 711

VII.

CERTIFICATE OF COMPLETION

Certificate of Competency

Vocational Occupations for Industrial Communications English

A Task Description/Competencies List
For Building Maintenance

This is to certify that the student has a proven competency
in all tasks listed on the back of this certificate

Student's Name	Instructor's Name
Date	Issuing Agency

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